GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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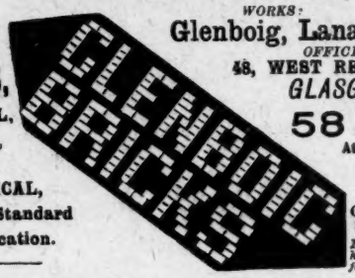

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLVIII., No. 2950.] TUESDAY, NOVEMBER 25, 1919. [71ST YEAR.

EDITORIAL NOTES.

The Gas Programme for Parliament.

So far as the notices in the "Gazette" and the Public Press have informed us, most gas undertakings are refraining from promoting Bills in the coming session of Parliament, and are standing loyally by the resolution passed at the representative meeting of the gas industry on Oct. 29, and so are showing their faith in the Board of Trade fulfilling their promise, and acting justly by the industry in the Bill which they are to introduce shortly. There are some undertakings whose statutory conditions or requirements compel them to go to Parliament in the coming session. There are a few of these who apparently cannot rely upon the Board of Trade, or believe they have superior schemes for dealing with the basis of charge for and quality of gas, and the revision of the sliding-scale, or it may be they are so driven by anxiety to get the necessary powers for converting their operations and stabilizing their conditions that they cannot trust to the dangers or delays that may beset a Public Bill. We hope that their attempt to thrust themselves forward in the parliamentary race will not be prejudicial to the common interests of the industry, and produce chaos and result such as have been previously experienced. We should, however, rather expect that, as the Board of Trade have definitely made these matters their own, and have now a Bill in preparation for next session, that those who are proposing to come forward with Private Bills dealing with the same matters will find that their Bills will be deferred, and in the respects in question will have to be assimilated to the proposals in the Government measure as endorsed by Parliament. The promoters of the Private Bills may themselves have anticipated this; and in some cases—not all—the notices may only be precautionary.

The South Metropolitan, the Commercial, the South Suburban, the Wandsworth, and the Brighton Companies are proposing to seek on their own account changes in the sliding scale of price and dividend. The South Metropolitan and South Suburban Companies have schemes of their own for dealing with the heat-unit basis of production and charging. The Commercial Company in their notice also mention calorific power and the heat-unit basis of charge. But apparently, alternatively, they are prepared to submit to any General Act that may be passed. The Wandsworth and the Brighton Companies are evidently going to rely on the General Act for the transfer of manufacture and trading from cubic feet to heat units. But we see that the South Metropolitan Company—formerly the champions for freedom in the gas industry, and strong opponents of restrictions—are contemplating, "if thought fit, to provide for the "determination or variation of the standard price in relation "to purity or degree of purity of the gas supplied." There is the making of complication here. The Gas Light and Coke Company, whose Governor is the President of the National Gas Council, are not promoting a Bill.

For the rest, the notices at present to hand deal with capital powers, lands and works, annual meetings, purchase of gas, sale in bulk, and matters more or less now general in Gas Acts. But there is a revival of purchase schemes, which suggest that local authorities are not anticipating the early demise of the gas industry, but, on the contrary, are looking to a big development in it. An outstanding Purchase Bill will be that of the Sheffield Corporation. It will take precedence of anything of the kind that we have had for many a long year. Two District Councils—Redcar and Masham— are desirous of becoming the possessors of the local gas undertakings. And what does it portend when it is found that the South Metropolitan Company are seeking to have power conferred upon them to enter into negotiations for the purchase of other gas undertakings?

Though we may not yet have the full programme before us for privately promoted gas legislation, there is already in it much of an arresting nature, and for developments there will be eager watching. Above all in point of importance will be the Board of Trade Bill; and this, it is hoped, will mean that the coming session of Parliament will provide for re-establishing the fortunes of the industry, and place it upon new lines which will enable it to enlarge its services, to the benefit of the national interests. The session will be a momentous one for all gas undertakings.

An Optimistic Review of the Position.

OPTIMISM is a great asset in a man's character when accompanied by practical considerations and aims. Lieut.-Col. H. W. Woodall has come back to the work of the gas industry, with the movements of which he has never, while performing his military duties, been completely out of touch; and he has since been making a study of the position as he finds it to-day, compared with that in which it was in the early part of the summer of 1914. His conclusions were incorporated in a paper he read before the Southern District Association last Thursday. He finds the industry's conditions far different from those which obtained at the time he left these shores for India, but much in them that is encouraging, and that offers good ground for optimism. So we think, providing the industry's weak places, produced by inflexible statutory ordinance in respect of financial terms and productive standards, are strengthened, as we are confidently hoping they will be. With the new liberty that is promised, the industry has to look and work forward and not backward. It has to find for itself a new normal stability; for there is little that had existence and sufficiency in 1914 that applies to to-day. These are things which have to be realized, and when realized—given the necessary encouragement, and the optimism of the writer of the paper before us—everyone among the men of the industry who are animated by a sense of responsibility will do his best part in the creative work from which satisfactory stability must come. "Gas engineers of to-day have before them "opportunities and responsibilities such as, I firmly be-"lieve, are not equalled by any other branch of engineer-"ing." This is a statement that can be given unanimous endorsement. But mark this! "The future is in our own "hands. The advancement of the industry must come "from within; and it is the gas engineer who must (and "I am confident will) carry it to the great position that "awaits it."

Never has the industry—not even at the advent of electric lighting—urged so much as it is doing to-day the gas engineer to give of the best that is in him. It is, however, a bold, far-seeing man who can penetrate the bulk of costs superincumbent on those of 1914, for coal (160 p.ct.), labour (120 p.ct.), materials (200 p.ct.), and manufactured goods, and say that "if gas undertakings rise to the great opportu-"nities lying before them, I am convinced that gas can be "sold in the early future at a price no greater than that "ruling before the war." The conviction must be strong that can incorporate with it in respect of future gas charges such a measure of time as "in the early future." We are afraid that all responsible gas engineers will not be prepared to subscribe to this prediction—at any rate, not for the present; for Lieut.-Col. Woodall is building upon plant condi-

tions which all cannot hope to possess "in the early future." And when he says that his conviction is that "gas can be "sold in the early future at a price no greater than that "ruling before the war," the question naturally arises whether he means per 1000 c.ft. or per 100,000 B.Th.U. (the gas "therm"). There is a great distinction; because it is clear that the principal way of procuring reduction of the cost of gas that Lieut.-Col. Woodall has in mind is by increasing, by steaming in vertical retorts, the production of B.Th.U. in the form of gas from the coal used, which steaming system, when carried out under the conditions which result in maximum efficiency, has in itself a beneficial protective influence upon, and so rescues, valuable constituents which otherwise would undergo sacrifice in the process of high-temperature carbonization. It seems, however, impossible for all gas undertakings for a long time to come to secure the conditions in regard to plant and coal that will enable them to sell gas at the pre-war figure. When we say "impossible," we are speaking with practical considerations before us, and not in any dogmatic spirit; for the paper indirectly issues through its data a warning against being dogmatic. Finality in gas production and use is not humanly definable to-day.

The paper gives us the results of steaming vertical retort charges at different works, spread over a considerable period. There are productions of gas ranging from 14,700 c.ft. and 7,056,000 B.Th.U. per ton of coal up to 35,400 c.ft. and 14,160,000 B.Th.U. per ton (400 B.Th.U. per cubic foot). This big return is realized with coal which only gave per ton 10,000 c.ft. of 540 B.Th.U. gas, or 5,400,000 B.Th.U., without steaming, and has not been looked upon as a good gas coal. Tar and liquor are increased by 80 p.ct.; but the coke available for sale is reduced by 25 p.ct. With that coal the steaming has an extraordinarily beneficial effect. A complete examination of the position cannot be made. But here we have the striking fact brought out that, in this exceptional case (which may not be exceptional as time passes), 141 gas therms are produced per ton of coal. Suppose the coal cost 50s. delivered, it would represent, leaving the secondary products entirely out of the question, 4·25d. per gas therm for coal. Let us suppose the pre-war cost of this coal was 16s.; and the B.Th.U. production then (without steaming) 54 gas therms per ton, the cost of coal would have been 3½d. per gas therm. Without steaming, at 50s., it would be 11·1d. per gas therm. Then we see in the paper, an actual comparison of carbonizing wages, which shows that, as a typical installation, before the war they were between 0·8d. and 0·9d. per 1000 c.ft., and are now, with steaming, 0·84d. This is using wet steam. When superheated steam is used, the make will be further increased, and the wages cost diminished per 1000 c.ft. Under steaming, too, the intervals of clinkering are being extended. Of course, there are many other figures that have to come into the calculation; but there we see sufficient to show that the optimism of Lieut.-Col. Woodall is not without a very practical foundation, where it can be realized.

An important thing is to have conditions right—the coal should be of a suitable class, and not one heavy with dust, which defies the steam percolating the mass. Lieut.-Col. Woodall protests strongly against the industry continuing to have to bear the burden and economic depression caused by unsuitable coal. In economies, he also sees the possibility of attaining a better fuel figure. He is a strong advocate of the use of waste-heat boilers; for the gases going to waste up the chimney carry off considerably more heat than would be necessary to generate the whole of the steam required for steaming the charges. There is not much definite information yet available as to the results with waste-heat boilers as applied to retort-settings; but enough is known to enable one to say that they are satisfactory in use, and that they can develop more steam than is required for steaming retorts. Superheaters, too, though not essentials, are aids to economy. On the other hand, we do not see much chance of coal being reduced in price other than seaborne, and that not yet. With the costs for mining what they are to-day, there is not much hope in that direction; and the cost of railway transmission looks more like ascending than descending. Increased production of coal per man would do something to ease costs; but the bird is in the bush. The greater the reason then for making a ton of coal go as far as possible. Lieut.-Col. Woodall does not advocate steaming of verticals to the exclusion of all other processes. Plant and working must be selected that will best suit the available coal and local needs. In all circumstances, however, three factors in the supply of gas should be kept practically constant. They are thermal value, specific gravity, and pressure. As to pressure, the fewest complaints in the Bournemouth Company's area come from a district to which the pressure starts at 10 lbs. at the works (it might be much less), where the services are governed by Donkin's high-pressure (mercurial seal) governor, and the pressure is maintained at 4 inches at the inlet of the consumers' meters. But the pressures in the mains must be kept at a reasonable figure, or there will be difficulty with the governors.

The industry will be in a much stronger position, with financial stability restored and manufacturing liberty granted. The scope awaiting it is a tremendous one. Heat is required in every house and industry. The saving of unnecessary labour in the house and the factory is a growing desire, and the advantage of material order. This is being recognized everywhere; and there is illustration in the remarkable records of the Bournemouth Company. In January last there were 27,428 houses covered by the gas-mains, and there were 27,416 consumers. This is a notable showing. Since then, without the sales by ironmongers, and without the appliances let on hire, the Company have had sales of appliances amounting to £20,471, and more would have been sold had it been possible to get them. There is another piece of counsel in the paper which really cannot be reiterated too frequently, and that is to avoid injury to reputation by seeing that reduction of calorific value is accompanied by the necessary adaptation and regulation of the plant or appliances in which the gas is to be consumed. This is highly important.

The paper is one of excellent quality in thought and matter. Its argument, facts, and data are aids to the intensifying of the confidence which is growing larger and larger as evolution proceeds in the affairs of the industry.

The "C.E." Tail-Light.

THE Institution of Civil Engineers are proposing to enter upon a campaign against the improper use of "C.E.," and to take the necessary steps to ensure that those who are not entitled to describe themselves as civil engineers shall not enjoy whatever glory attaches to doing so, and shall not impose upon the public by the act. There is no more reason why a man should be allowed to use the tail-light "C.E." than "M.D.," if he has not the proved necessary qualifications. So the Institution of Civil Engineers are going to ask Parliament, in the next session, to give them power to put an effectual stop to the practice. The mode in which they are intending to do this is to seek, by a Bill, for a slight amendment of their Royal Charter and Letters Patent. If this is granted in the form proposed, the Institution will be empowered to establish and keep a register of civil engineers, and to prescribe and make provision as to the persons who shall be entitled to be registered. Certain qualifications will be prescribed, and examinations be held for the purpose of enabling persons to enter for registration. There are no doubt engineers who are qualified as civil engineers, and who have been practising for years, but are not members of the Institution, and to whom an injustice would be done if provision was not made in some suitable way (by the submission of sufficient proofs) for inclusion on the register, without having to go through any considerable formalities. The Bill will make provision for this. It is also contemplated to establish a tribunal or body of some kind to hear and determine claims. And provision will be made for giving power to refuse admission to the register, and for the removal of names in certain circumstances. Fraudulent representation will be dealt with; and power to take steps to prevent persons representing themselves as civil engineers, or using the name and title, who are not registered. In addition, it is proposed to prohibit registered engineers practising or being in partnership with persons who are unregistered. So it has become necessary to ensure that those who profess and call themselves civil engineers are really so. The powers proposed are large, and will require very delicate handling. Whether the Institution of Civil Engineers (though at the head of corporate engineering) should have, without other technical engineering organizations being directly associated with the tribunal it is proposed to form, the sole right of arbitrating on such a matter as a man's qualifications, may well be open to discussion. Nothing should be left undone to ensure justice. It is not a question of want of faith in the Institution, but

a matter of assuring the presence on the tribunal of adequate knowledge in all cases. If the membership roll attests the capacity of the Institution to determine the qualifications of men for admission to the ranks of civil engineers, then we are not hopeful for the future. We take it that all those on the present membership list will be entitled to be registered, as we do not see any provision in the notice of the Bill for cleansing the list of the names of any whose engineering qualifications are of such an exiguous order that to call them "civil engineers" is a very high compliment that could not be defended.

Beilby Report Endorsed by a Distributing Engineer.

WE advise those members of the Yorkshire Juniors who heard Mr. Walter Hole's address last Saturday to read it, and those juniors (or, for the matter of that, others) who did not hear it to peruse it, and to mark its points. It is well worth consideration. "New times" are here with a developing tendency along freshly constructed and somewhat strange lines. The new times are not altogether pleasant; but though mixed up with difficulty, there is in them good promise. The difficulties, Mr. Hole points out, may easily become greater. But in surmounting them one's powers are developed; and this, as he says, brings gratification. It does something more. The development of power by successfully grappling with difficulty equips us better for dealing with the greater difficulties which may arise, though, if they are going to be worse than they have been during the past five years, then they will be bad indeed. Excellent as is the forepart of the address, interest gets largely concentrated on the part which directly deals with the position of the gas industry in relation to the new times. The industry is in for a very radical change, which will have a powerful effect upon its development.

In regard to the changes formulated by the Fuel Research Board, much that is good has been heard from the gas manufacturer; but there has hitherto been no pronouncement upon them by a distributing engineer of such acknowledged competence as Mr. Hole. He approves entirely of the transfer of the industry's operations from cubic feet to B.Th.U.; and the change has no terrors for him, though it is the man outside the works who will be most intimately affected, as he is the man who will have to deal with the gas produced. He likes the comparative freedom and elasticity; and he sees great possibilities in the supply of two qualities of gas in industrial areas within, or in proximity to, which gas-works stand. High-pressure low-grade gas could be cheaply distributed in large quantities within reasonable distance of the gas-works, "which is certainly a development "to be anticipated in the near future." One notes these words. Leeds being what it is in industry, we shall be looking to it as one of the pioneers in this matter. It is clear that the report of the Board of Fuel Research is not only constructive, but highly suggestive; and its seed is falling on good ground. Distributing engineers will be looking around for likely areas for preliminary venture in the supply of a low-grade industrial gas. When a lead is given, who knows what may follow in the development of industrial business in this way?

Instead of assuming all manner of difficulties, Mr. Hole welcomes the proposal to charge upon the heat-unit basis —in fact, in his judgment, the difficulties of making the change have been over-emphasized. Further, he sees nothing to prevent an index being designed for all new gas-meters to register in thousands of B.Th.U. instead of cubic feet. Meter indices have no preference for cubic feet, though, of course, gas volume would always have to be associated, though not registered, with the measurement of the potential energy supplied. But there is no particular reason why the registration should not be in B.Th.U.; and it should cause no more trouble, when a change is made in the declared calorific value of the gas, than does a change upon an alteration in price of the cubic feet given for a penny through prepayment meters. It is Mr. Hole's belief that sooner or later, if the industry sells on B.Th.U., it will have to register B.Th.U. It will not for ever be able to sell in one denomination and register in another. The hybrid system may continue for a time; and, as a temporary expedient, the double index may come in. But gradually, with opportunity, there will be a transfer of new meters to a B.Th.U. index as the basis of sale. One meter maker, as recently recorded in the "JOURNAL" [*ante*, p. 311], has already set the pace by developing a B.Th.U. mechanism for attachment to meters; and meter makers generally will be expected to be early in the running.

We are carried by the address to many other subjects; and the road appears to be perfectly clear for a large and continuous constructive policy for the industry. Sir Dugald Clerk and Professors Smithells and Cobb have shown us how we stand both thermally and technically in relation to competition. But the Government are asleep. They have failed to see the interrelation of industries in the matter of fuel and power supplies. The gas industry is now taking, in increasing amount, gas from the coke-oven industry; and the electricity industry should in the national interests be utilizing to a greater extent than it is doing the coke for steam generation arising from the provision of gas to urban communities. Fuel use should be synthetized and co-ordinated. So long as it is not, there will be waste. When too late perhaps the Government will awaken to this fact. But in these reflections are seen opportunities for the development of the industry's business relations in various directions, to add to the plans for gas-works amalgamation and bulk supply of gas from central works, in which concentration of manufacture, as Mr. Hole mentions, high-pressure transmission has come as a good aid. Then there are the housing schemes, in which gas must have a large part, if the schemes are to be up to the standards of comfort and labour-saving made available by modern development. To-day everything is tending in gas-works to make them the sources of fuel distributed by subterranean means, and not by the crude mode of surface cartage. Some 40 million tons of coal are used annually for domestic purposes; and in the very best circumstances, the fire-grate only gives to the householder useful service to the extent of 20 p.ct. of the potential heat of the coal. Assuming it is coal of a calorific value of 30 million B.Th.U. per ton, 20 p.ct. is 6 million units. There are gas engineers with suitable carbonizing plant and coal who are putting 10 million B.Th.U. into their gas-mains per ton of coal. Allowing in such cases 5 p.ct. leakage in distribution, and gas-fires, with 20 to 25 p.ct. of the heat generated passing away by the chimney, heating by gas would usefully give to the consumer 7 to 7½ million of the 10 million B.Th.U. The coke and the other valuable bye-products are to the good. Mr. Hole is quite satisfied as to further advances being made in the efficiency of gas appliances. With these and other considerations before him, he finds, if the industry's hopes are fulfilled as to the betterment of its financial terms, and the conferment of fresh liberties, that in the new times the industry's progress will be of the best.

B.Th.U. Production per Ton.

A feature of the papers and discussions at the Southern District Association meeting on Thursday was the consistent way in which quotation was made of the B.Th.U. produced per ton of coal, and there were calculations of cost based on the proposed gas "therm." (100,000 B.Th.U.). When the new legislation gives the industry a fresh basis of operation, it will soon become old-fashioned to quote in cubic feet.

Waste-Heat Boilers for Retort-Settings.

For some time America has been using waste-heat boilers in connection with retort-settings. With the large installation of Woodall-Duckham settings to be constructed for Glasgow, waste-heat boilers will be incorporated. At the last annual meeting of the Society of Chemical Industry, Captain C. J. Goodwin read a paper on the subject, and supplied testimony as to the economy to be realized. In his Southern District Association paper last week, Lieut.-Col. Woodall pointed to waste-heat boilers as one of the economies awaiting fuller application to gas-works operations; and from what he says there is good foundation for stating that there is waste heat sufficient, or over and beyond what is necessary, for the creation of a natural draught, to provide all the steam required for steaming charges. In "The Times Engineering Supplement," Mr. Alwyne Meade discusses the theoretical considerations applying to the raising of steam in this manner; and, in the course of the article, he mentions the case of a bench of Woodall-Duckham retorts (carbonizing 200 tons per day), the chimney gases from which evaporate approximately 6000 lbs. of water per hour at a pressure of 130 lbs. Mr. Meade does not think that the corrosion of tubes due to sulphur dioxide need be feared so long as the gases in contact with the metal are not

reduced in temperature below 275° Fahr. If, however, more complete extraction of the sensible heat is aimed at, then particular attention must be given to the tubes forming the feed-water heaters. Of course, the attractions of waste-heat boilers, from the economy point of view, will depend largely on the size of the works and the steam requirements, as well as the demand for, and the price of, breeze.

Unrestricted Gas Consumption.

Gas and electricity consumers have been released by the new Coal Controller from the trammel of the limitation of the consumption of gas and electricity. This is a suspension, and not an absolute revocation, of the provisions referring to gas and electricity in the Fuel and Lighting Order. The provisions have been variously regarded by gas undertakings. In the times when undertakings have been cornered for coal, there has been thankfulness that the provisions were in force; while, on the other hand, they have had a part in contributing to the difficulties of gas undertakings with their consumers. With the exception that the provisions acted as a check upon wasteful consumption by those who can afford to waste, the price of gas would have been in most cases a sufficient deterrent to extravagance; and if gas undertakings had been crippled for coal, the consumers would have been compelled to economize. On the whole, no harm will be done by the suspension of the provisions; and most gas undertakings will be pleased to have this particular fetter removed. The removal is a sign that the Coal Controller takes a hopeful view to-day of coal output. As a matter of fact for the week ending Nov. 8 the output reached 4,804,456 tons, which beats all the weekly records for more than six months past—seven-hour day notwithstanding.

The Gas "Profiteers."

It is a good thing the gas industry has a broad back. It has lately been everything bad, through complying with Government instructions, and for charging prices which the current costs of materials and labour compel. "Charges" of wrong-doing have multiplied; and the industry has been maligned and abused with a liberality which should have gone to other quarters—for example, to the coal, shipping, and other industries from which have sprung the main causes for higher gas prices. A recent article was headed "Why not Cheaper Gas? A Profiteering Scandal." That is not just with dividends being paid that are only three-quarters the standard under the sliding-scale. There is a profiteering scandal from which gas consumers suffer. But the gas industry is only the channel through which the "profits" pass to the quarters from which its materials are drawn; and in these quarters labour appears to absorb the larger portion of the payments. The "Globe" readers have at all events been assured through an interview that a contributor lately had with Mr. Milne Watson that the term "profiteer" as applied to the gas industry is unjustified. One of the points he made has reference to the mistaken notion that the industry profits not only largely from gas, but in some mysterious way from the secondary products. The Governor of the Gas Light and Coke Company showed that the revenue of the undertaking from coke and chemical products in 1918 was 61 p.ct. of the cost of the coal, as against 79 p.ct. in 1913.

OBITUARY.

Mr. GEORGE H. NIVEN, of Cleckheaton, who was Gas Manager there for 34 years, up to his retirement in 1911, died on the 20th inst., at the age of 73. Mr. Niven was well known in the gas industry generally. Since his retirement from the active management of the old Cleckheaton Gas-Works, he has been, up to the time of his death, Consulting Gas Engineer to the Cleckheaton Council and the Spenborough Council who succeeded them, and has been of great service in connection with the establishment of the newer works. He had been in poor health for about a year past, and had three strokes during the last week.

Mr. Edwin Smith, who was for many years Secretary of the Birmingham Gas Department, and whose death occurred a few weeks ago, aged 79, left estate of the gross value of £5420.

At a meeting of the Illuminating Engineering Society this evening, the Hon. Secretary (Mr. Leon Gaster) will present a report on progress, and the work of the various Committees will be referred to.

PERSONAL.

Mr. MATT. DUNN, having placed in the hands of the Gas Committee his resignation of the position of Engineer and Manager of the Stockton-on-Tees Corporation Gas-Works, the Committee unanimously resolved not to accept the resignation, and (after passing a vote of confidence in him) offered, provided he withdrew his resignation, to increase his salary by £100 per annum. This offer, however, Mr. Dunn felt unable to accept; and his resignation therefore takes effect. In all probability he will start practice locally in a consultative capacity. After having been Assistant Manager at Stockton for over twelve years, Mr. Dunn succeeded Mr. William Ford as Manager in 1915. Previous to going to Stockton, Mr. Dunn was Manager at Selby and at Goole, where he carried out a deal of constructional work. His articles were served with Messrs. Ashmore, Benson, Pease, & Co.

Mr. L. W. NUTTALL has resigned his position as Gas Manager to the Goole Urban District Council, in order to take up a similar appointment with the Pembroke Gas Company. He has been at Goole for three years, and has done good work there, which was acknowledged by the Chairman of the Gas Committee when referring to the forthcoming departure of Mr. Nuttall.

Alderman W. H. DELVES, of Tunbridge Wells, attained his ninetieth birthday on Tuesday last, but is still keen and alert in business matters. He joined the Board of the Tunbridge Wells Gas Company as long ago as 1859, and has been Chairman since 1887. He is also the "Father" of the Town Council. Greatly respected in the town for which he has done so much, it was felt that such an occasion as last Tuesday should not be allowed to pass without suitable recognition being made of his long services. Accordingly subscriptions were invited, and a very fine three-quarter length portrait of him in oils was presented to the Town Council, while Alderman Delves was made the recipient of an album in which will be recorded the names of the subscribers. A replica of the portrait will also be presented to him. He was Mayor of the town in 1900, and made honorary freeman in 1910.

Alderman J. H. M'GAUL, J.P., who for the past fourteen years has been Chairman of the Gas Committee of the County Borough of Birkenhead (having accepted the office of Mayor), has decided to retire from the Gas Committee, and Mr. LUKE LEES has been elected in his stead.

On Friday evening, Mr. WILLIAM M'CULLOCH, Assistant Chief Clerk in the Glasgow Corporation Gas Department, at a gathering of officials in the offices of the department, presided over by Mr. John Smith (the Chief Clerk), was the recipient of a handsome mahogany Sheraton timepiece and a silver wristlet watch for Mrs. M'Culloch. Mr. M'Culloch goes South to take up a similar position with the Sheffield Gas Company. In making the presentation, Mr. Walter Grafton (Manager's Assistant) referred to the splendid service rendered by Mr. M'Culloch during the period he had been with the Corporation, and to the hearty response the testimonial had met with.

Society of Arts Papers.—Among the papers to be read, after Christmas, before the Royal Society of Arts is one by Mr. H. M. Thornton, on "Gas in Relation to Industry and Housing." Mr. L. Gaster will also contribute a paper entitled "Industrial Lighting in its Relation to Efficiency."

Scottish Junior Gas Association (Western District) Meeting.—With so much matter to overtake in the present issue, it has unfortunately been necessary to hold over until next week the report of the proceedings at last Saturday's meeting in Glasgow, when Mr. J. M'Nicol, of Dawsholm, read a paper on "Water Gas."

Alcohol as a Motor Fuel.—Some figures relating to the use of alcohol and other fuels in moter vehicles were given by Dr. T. Blackwood Murray in the course of his address as President of the Institution of Engineers and Shipbuilders in Scotland. In France, some years ago, a mixture of 50 p.ct. alcohol, 35 p.ct. benzol, and 15 p.ct. petrol was tried in comparison with pure benzol and pure petrol. The results showed that 46·3 gross ton-miles were obtained per gallon of alcohol mixture; while for petrol and benzol the corresponding figures were 53·2 and 57·1 respectively. He is confident that denatured alcohol could be delivered to the consumer at a figure at which, taking the current prices of petrol and benzol as 3s. 0½d. and 2s. 9d. per gallon respectively, the cost per ton-mile would be 0·53d. for alcohol mixture, 0·578d. for benzol, and 0·686d. for petrol.

Tests of Flexible Gas Tubing.—In Technical Paper No. 133 of the United States Bureau of Standards, the results are detailed of tests on about thirty typical varieties of tubing. They show that much of the material on the market is made of paper, covered with some tar compound. There are several varieties of tubing which, if used with ordinary care, can be considered safe for all ordinary purposes; and the life of the better varieties is so much greater that it is really cheaper in the end. Much of the danger in gas-tubing comes from the poor grade of rubber end-pieces; and the tests showed that there was as great a variation in the quality of these as in the quality of the tubings themselves. American gas engineers have realized that the interests of the gas industry require the production of a safe gas tubing; and as a result the National Commercial Gas Association and the American Gas Association, working in conjunction, formulated a set of tentative specifications.

A WELCOME HOME.

The Gas Light and Coke Company's Reunion.

"THE number of those who joined His Majesty's forces, 5363; number of those who were killed, 490; number of those who received decorations, 60." These are wonderful figures for one undertaking, even though they do apply to the largest gas company. They constitute the record of service from 1914 to 1918 of the employees of the Gas Light and Coke Company, and are taken from the programme of an entertainment given last Friday evening at the Royal Albert Hall. It was a memorable occasion, both for hosts and guests. The hosts—the Directors of the Company—extending, in this kindly form of "Victory Reunion," a welcome back again to those in their employ who have been absent with the forces, must have felt amply rewarded by the appreciation shown by their 6500 guests—a large audience, made up entirely of those who have been away on war service, with their wives or sweethearts. Looking round the crowded hall, one wondered whether Mr. D. Milne Watson (the Governor), or the Directors and heads of departments who were present, had ever before seen so many of the Company's servants together at one time. Yet, of course, the men numbered less than one-quarter of the total employed by the Company; and some 500 or so have still to return from war service.

The copies of the programme will be retained as valued souvenirs by those into whose hands they came; for in the centre was a "Roll of Honour," containing the names of all those in the employ of the Company who joined the forces during the war—those who gave their lives for their country being specially indicated. The programme will also serve to remind the possessors of a happy evening, during which they listened to an entertainment contributed to by many very well-known artistes. There was an interval for the serving of refreshments, and at one point in the proceedings, the Governor went on to the platform, and, in a brief but feeling little speech, welcomed the guests in the name of the Directors of the Company. He said:

Friends,—In the name of the Directors of the Company, I bid you welcome. We are met together in a Victory re-union, to celebrate the return of those who have been fighting for their country. We also extend our welcome to the mothers, wives, and sweethearts, many of whom have taken the places of the men during the war, and worked valiantly for their country during these long years. All have, in anxiety, watched, waited, and prayed for their return. We now rejoice with them in their happiness. We should have liked, in the day of victory, to have met each man individually, and said to him, "Well done." Unfortunately, the numbers were far too great to admit of this. But we wished to commemorate the occasion in some very special manner, and so we have asked you to meet here that we might rejoice together, and remember together. Of the 5000 gallant men who went forth from the Company to fight the battles of freedom, 500 will never return; and amidst our gaiety and rejoicing to-night, let us think of them, and be thankful for their fine example. Of the 4500 men who have lived to come home, some have returned with military honours and distinctions, some with equally honourable wounds and scars from the battlefield. But whether or not you have received any outward mark of your services—We are proud of you. [Applause.] All of your comrades in arms are not with us to-night; for nearly 500 are still serving with the Colours. We hope, however, that before long they also will return to their labours of peace. When you left us to serve your country and your King, we promised to keep your places for you; and we are very glad indeed that so many have come back to the old Company. [Applause.] Little more than a year ago you were, in your various units, scattered all over the world—some behind the barbed wire of the enemy's prison camps, some fighting in the sodden fields of Flanders and of France, some in the vineyards of Italy, some in the burning heat of the desert, some in the mists of the North Sea, some in the clouds and currents of the air, and some, as modern Crusaders, in the Holy Land. To-night you are together again, as one family, "a band of brothers." We believe that for every suffering nobly endured, for every discomfort cheerfully borne in your country's service, you are better men, better workers, and better citizens—that you will

> "Honour with braver lives the brave that went
> Swiftly to death in honour's argument."

The three hours and more during which the entertainment lasted passed all too quickly—as is the case with time that is pleasantly spent; and those with whom the happy idea originated, and who were responsible for the excellent carrying out of the arrangements, had every reason to feel gratified at the result.

Discovery of Acetylene Gas.—Speaking at the Dublin Rotary Club on the history of the Royal Dublin Society, Mr. Edward Bohane, Superintendent of that body, referred to the early announcement at one of the Society's lectures, in the thirties of last century, of the discovery of acetylene gas. The lecturer, Prof. Davy, he said, gave an account of a then apparently new gas produced by the action of water on a substance obtained by the heating of tartrate of potash in a retort; and he exhibited at the meeting some experiments with the gas, now known as acetylene. As often occurred in those days, it was not persevered with, and some 23 years later was re-discovered by a French chemist.

INCOME-TAX AND GAS-WORKS REPAIRS AND MAINTENANCE.

By direction of the Sub-Committee on Income-Tax of the Gas Companies' Protection Association, the Secretary (Mr. Fred E. Cooper) has forwarded for publication a copy of a circular which has been sent out to members of the Association, dealing with a matter of interest to all gas companies throughout the kingdom. The circular is as follows:

SECTION 18, FINANCE ACT, 1919.

Dear Sir,—The Income-Tax Sub-Committee of this Association have had under consideration "Form F.A. 6," forwarded to gas companies by H.M. Inspectors of Taxes, with reference to claims to be made under the provisions of section 18 of the Finance Act, 1919.

As it appears that Inspectors of Taxes take diverse views of the effect of the section—some holding that the one-sixth deduction to be allowed thereunder is in addition to the ordinary allowance in respect of repairs and maintenance, and others that the allowance is in substitution thereof—the Sub-Committee have communicated with Mr. E. Stanford London, C.B.E., the Deputy Chief Inspector of Taxes, upon the matter. They are informed by him that the allowance in question does not in any way affect the right to charge as an expense the ordinary cost of repairs and maintenance in so far as the same would otherwise be allowable.

In answer to inquiries received from several members of the Association, the Sub-Committee desire to state that the allowance in question should be made in respect of buildings, even though not enclosing machinery, where such buildings are in the nature of stores, warehouses, or administrative offices ancillary to, and forming part of, gas-works.

The Sub-Committee are of opinion that the section is a concession of which gas companies should take advantage.—Yours faithfully,

FRED. E. COOPER, Secretary.
Gas Companies Protection Association.

5, *Victoria Street, S.W., Nov.* 11, 1919.

SIXTY YEARS AGO.

[From the "Journal" for November, 1859.]

Oxide Purification Experiments.—The re-opening of the doors of Westminster Hall reminds that the wearisome case of *Hills v. London Gas Company* may shortly come on again, upon the motion for a new trial on the ground of the verdict being against the weight of evidence. Since the matter was last before the public, we have received from Denmark samples of a native hydrated peroxide of iron which is found in that country in inexhaustible quantities, and is extensively used in the Danish gas-works for the purification of gas, either alone or, what is preferable, in combination with chalk. It is found in considerable masses, in which state, we are informed, it can be delivered at the chief ports on the east coast of England for 30s. or 35s. per ton, at which rate it appears to us to be the cheapest known material for the purification of gas. It only requires to be reduced to a coarse powder to prepare it for the purifiers. Its affinity for sulphur is equal to that of the artificially prepared or precipitated oxide. It revivifies as easily; and it becomes again active when the sulphur has been driven off by heat. Experiments are now in progress at a provincial gas-works with the view of practically testing it in this country; and as it infringes upon no patent, much interest is excited in the result. Mr. Barlow will be happy to give such further information as may be sought for by anyone desirous of making an experiment.

A Suggested Directory.—With the view of complying with the numerous applications made to us for a continuation of the share list of gas companies we some years since published periodically, we have caused tabular forms to be forwarded to every gas company in the United Kingdom, with a request that they may be filled up and returned. A large number have been so returned; but as many of the provincial companies have not as yet responded to the application, we earnestly entreat them to do so forthwith. If any company has failed to receive a form, it will be forwarded on application. It is our intention, if the returns are sufficiently complete, to compile a directory with the names of the chief officials of gas companies throughout the country.

An Asphalte Gasholder Tank.—Mr. H. W. Smith, of the Seaham Gas-Works, writes: I am fully persuaded that coal tar, now becoming a drug in many of our gas-works, may be made into several useful articles. Boiled (with the spare heat any gas-works can supply) into pitch, mixed with sand and gravel, and made into blocks of any size or shape, it makes an admirable substitute for stone for underground works. It is indestructible where kept cool. I have myself just finished a neat little gasholder tank, 24½ ft. diameter and 15 ft. deep, built with blocks made as above, and moulded in loam; each block being part of the circle. Blocks of any size or form may be made in this manner. Cylinders of any size for drains might be made in 3 ft. or 4 ft. lengths. Nor is this all the profit. During the boiling into pitch, the pan might be covered, and the naphtha collected as from a retort or still.

The Blackburn Corporation Gas Sub-Committee have interviewed the four selected candidates for the position of Gas Engineer, and reduced the number to two for the final selection.

ELECTRICITY SUPPLY MEMORANDA.

The Outskirts of Gas Topics.

It may be assumed that the electrical press has about exhausted itself in its puny efforts (which reflection should show is a wrong policy) to disparage the proceedings at the annual conference of the British Commercial Gas Association. These proceedings have afforded them plenty of groundwork; but the most striking feature of the comments and criticisms has been the inability of the writers to do more than display the old fund of platitudes and a vast ignorance of scientific truth. The "Electrical Review" supplements what it has done before, and which we have already criticized, by touching upon the topic of "Gas and Hygiene"—the [subject of Dr. Samuel Rideal's paper. But not in a single instance did it dare to assail the work or conclusions of the investigator. The fact speaks louder than the petty method so consistently favoured in the electrical press of writing on the outskirts of subjects affecting gas. The writer of "Gossip" in "Electrical Industries" agrees that the men who took part in the proceedings possess "some" scientific distinction, but little influence on public opinion. Lord Moulton, Sir Dugald Clerk, Sir Arthur Duckham, and Prof. Cobb will no doubt be deeply gratified over the estimate as to their scientific distinction, and as to their speeches being of a "pseudo-scientific" order, of such a competent judge as the writer of "Gossip" in our electrical contemporary. It is highly amusing. And as to influence on public opinion, a better estimate of this than is afforded by words in the electrical papers is to be found in the postbag of the Association, and in the inquiries and new business done by gas undertakings.

The Thermal Energy Suppliers.

It is learned, too, from the same source that the gas industry is a "dusty" one, which requires to polish itself up; and reference is made to the Bill which is in preparation for dealing with the method of charging for gas, and for the revision of the sliding-scale. We think a little light is penetrating to this electrical writer through the haze which those of his kind profess to find surrounding gas affairs. That old piece of self-deception of electrical people as to gas varying by remarkable lengths (other than in war time) in respect of both quality and pressure, is again trotted out. But he evidently sees something which is a matter of concern, in that he understands "gas undertakings will be compelled to sell gas on a basis of calorific value, and the stated value must be maintained under penalties." It does not seem to be within his knowledge that gas has always been subject to statutory standards (which were lowered during the war and the period of coal shortage), and that in normal times penalties have been inflicted for defections which reasonable care could have avoided. The whole object of the change proposed by the Board of Fuel Research—as has been before explained to electrical critics—is to enable gas undertakings, under their individual conditions in regard to plant and coal, to work better for thermal efficiency than under the old standards, which better working will mean economy of coal per unit of potential heat energy realized. It is the latitude that is being given in this respect that carries with it the obligations to charge for the actual thermal units delivered, and to give under the specified conditions a minimum pressure of 2 inches. There is nothing in this. Pressures are now almost universally higher than this in gas-mains. The difficulty is that in some cases the pipes in the older houses have become overloaded through the increased use of gas. This shows the emptiness of the comment drawn from an imagination that is not fortified by correct information: "Whether the industry will be able to improve the regulation of the gas pressure above the present low standard is another matter [the gas industry would not have agreed to it if it could not do so], but the accession of honesty as regards quality of the product will deprive the central station engineer of one familiar argument when he happens to be fighting gas." The "accession of honesty" is good. It shows a highly cultivated appreciation of personal merit and of demerit in others. We hardly think the electrical industry will be proud of such fatuous babbling, nor of the misrepresentation that the "JOURNAL" has been calling the attention of the gas appliance makers to the "wretched design and construction of gas-fittings." What we have been doing is to call their serious attention to the need of equipping all gas-heating appliances with air-adjusters, so that, whatever thermal grade of gas is supplied in any locality, the burners can be adjusted to give the best efficiency. Had all appliances been so fitted, there would not have been complaints of "bad gas" when at the time of the railway strike the Government ordered that the maximum quality of gas should be 425 B.Th.U. in order to help to spin-out the coal supplies.

New Conditions and New Business.

The same writer goes on to give an epitome of Sir Arthur Duckham's speech at the "B.C.G.A." meeting, in which he reproached the Government for not having taken a broader outlook in dealing with the question of coal conservation in relation to light, heat, and power, by surveying the whole of the problems and possibilities instead of confining itself to electricity. The result of its limitation has been that it has misled not only itself, but for the time a section of the public, who began to think that electricity was going to save millions of tons of coal a year, and that in some mysterious way it was going to enable heating and power to be supplied at next to nothing. The dream has vanished before actualities. The other day another electrical contemporary was congratulating the industry upon the fact that the bulk of the plant it possesses was put down on the pre-war basis of expenditure. Capital charges are predominant in the total costs of electricity generation and distribution; and therefore the point was regarded as highly important. But much of this plant is of an order that means large expenditure of fuel per unit generated; and much of it has reached the end of its tether in respect of capacity. New business will therefore have to be taken on the basis of capital charges as they exist to-day, as well as fuel and labour costs, which latter will apply to the old plant as well as to the new. Charges for depreciation and renewal of the old plant will also have to be revised; and as the provision for depreciation and renewal (where provision has been made) has been at the old rates, there will be some leeway to be made up in this respect. This has some bearing on what Sir Arthur Duckham said. He was right. He was not suggesting a line of demarcation in the businesses of gas and electricity suppliers. He was complaining that the Government had not done something which they ought to have done in the national interests, and that was to have thoroughly investigated the light, heat, and power situation, and to have produced a plan of co-ordinating the means of provision, so that the best possible in the national interests could have been done with our fuel resources. The Government are not, however, leaving the gas industry out in the cold; and their adoption of the report of the Board of Fuel Research will put the gas industry into better fighting trim for business purposes than it would otherwise have been in the changed economic circumstances.

Competition under the New Order of Things.

The writer in "Electrical Industries" remarks: "So long as the gas industry demands that certain fields shall be reserved for it, and so long as electricity wants to try its fortune in every field, there is no possibility of any fruitful co-operation." We are not so sure as the electrical writer that there is even yet "no possibility of any fruitful co-operation." It may still be found that it will be in the country's interests for steam-raising plant at electricity stations to be so equipped that there will be "fruitful co-operation." And as to the reservation of certain fields of business, the gas industry will be quite content to gain business under the new order of things by sheer merit and economy. All it asks is that the Government shall leave the field open for fair competition, and not grant any favours to the one industry or the other which will undermine fair competition on a sound financial basis. Electrical writers have yet to learn that bombastic words are not the realization of the goal. In this connection, it is noticed that the fear still exists that electricity supply undertakings are not yet alive to the value of a full measure of stimulation for securing an accretion of business. Our contemporary congratulates the electrical industry upon the articles now appearing in the London and provincial newspapers on electric lighting and the auxiliary uses of electricity. But consumers are learning that even electric lighting makes considerable appeals to their pockets apart from discharging the lighting account at a greatly enhanced cost. The war commenced less than sixty-four months ago. But Mr. F. W. Willcox, who knows all that is worth knowing about electric lighting, states that the lighting installation which has not been revised since the beginning of the war must be obsolete, and our contemporary says this applies to domestic, shop, factory, street, and every other kind of installation. "With the increased production of gas-filled lamps, and the introduction of new types of diffusing reflector, the time is opportune for emphasizing the economy and efficiency of modern electric lighting." The consumer looks at this from the point of view of his purse; and now that installation expenses are very much up, people are more and more questioning the "economy." The other day a consumer showed us a quotation for extending his lighting connections; and it worked out to 50s. per point. With electricity costing 10d. per unit, he is withholding instructions to go on with the work. However, our contemporary appeals, as others have appealed, for local co-operation with the Press campaign, which is giving a "mental impulse" which needs local stimulation. We quite believe this.

Electric Ovens and Loss of Heat.

The lady Cookery Demonstrator for the Westminster Electric Supply Corporation, Limited (Miss Amy C. Cross), sends a letter to the "Electrical Times" which needs no comment. Here it is: "In testing various types of lagged ovens which have been for some years on circuit, I find that in many cases the time taken to reach a given temperature is considerably greater than when the same oven was new, although the elements are found to be in perfect condition. On the other hand, we have a lagged oven in our kitchen which has been in constant use for seven years, and takes no longer to heat to-day than it did when it was first installed. It would be interesting to know if any of your readers have observed the same thing, and can throw any light on the subject. Is the explanation to be found in the different methods of lagging or in the quality of the slag wool used? The question seems to me an important one, as it makes so much difference to the cost of electric cooking."

THE AMENDED ELECTRICITY SUPPLY BILL.

Clauses which have Interest for the Gas Industry.

THE Electricity Supply Bill, amended by Standing Committee B, has now been printed and published. It has been hammered and knocked into shape by the Committee, and it is now not the thing that was originally introduced. It has been loosened and changed in many respects—mostly in ways which materially and beneficially affect the interests of present generating station owners, although not completely meeting their desires. Loopholes have been made here and there; but the existing owners have to do something to improve and co-ordinate the generation of electricity in defined areas. It is one of the functions of the Electricity Commissioners—of whom there are to be five, three being whole-time officers, and three having practical, commercial, scientific knowledge, and wide business experience, including that of electricity supply—to see that action and not apathy exists where improvement in organization and provision is deemed possible. If the local electricity suppliers and those interested in the supply in a defined area do not submit a scheme for a District Board or Joint Authority, the Electricity Commissioners may themselves formulate one for the constitution of a Board. Powers are to be given for the conducting of experiments for the improvement of the methods of electricity supply or the utilization of fuel. The Electricity Commissioners may appoint an Advisory Committee. The making of Orders by the Electricity Commissioners is to have strict surveillance. There is to be confirmation of the Orders by the Board of Trade, as well as endorsement afterwards by both Houses of Parliament.

It is a wearisome business reading through the 42 pages of the printed Bill, with its 48 clauses, and the clauses their ample progeny of sub-sections. But we will only touch those which have special interest for the gas industry. The establishment of even new private generating stations will have to comply with the Commissioners' regulations as to type of current, frequency, and pressure. The District Boards will have powers which will operate to keep authorized undertakers up to the mark, and will hasten their desire to meet the demands for supply from an uncultivated area. The power to supply "any form of energy other than electricity" is retained in the Bill. But the National Gas Council will continue to move in the matter of obtaining either deletion or qualification. It is remarked, too, that—

> A District Electricity Board may, with the consent of the Electricity Commissioners, erect, maintain, alter, improve, and renew bye-product plant, with all necessary machinery and apparatus, and do all such acts as may be proper for working-up and converting residual products arising directly or indirectly from the production of electricity. Provided that, where it appears to the Electricity Commissioners that the establishment of any such bye-product plant could be properly undertaken by any existing company, authority, or person, a District Electricity Board shall not establish such plant without first giving to such company, authority, or person, an opportunity of doing so.

The terms on which existing generating plants and transmission lines may be transferred have undergone some modification; but they are far from being of the nature which the present owners think they ought to have. From the stations established under the section referring to loans from the Treasury, the electricity supplied is to be at prices which shall be such that the receipts will be sufficient to cover expenditure on income account. But it is provided that, in fixing such prices, the Board of Trade shall have regard to the existing scale of charges of the authorized distributors in the district, and that the provisions of section 7, sub-section 5, shall extend and apply to the Board of Trade in the same manner and to the same extent as such provisions apply to a District Electricity Board. The sub-section in question puts upon a District Electricity Board the obligation to supply to any body from whom a generating station is acquired, electricity not less in amount than could have been generated at the station transferred, at a price not greater than the cost at which it could have been generated. In determining the cost, regard is to be had to the capital charges, the cost of fuel and labour, and other expenses of generation.

To the Electricity Commissioners are to be transferred the powers of the Minister of Health, the Secretary for Scotland, and the London County Council with respect to the sanctioning of borrowing by local authorities under the Electric Lighting Acts or any Special Act; but in exercising the powers so transferred, the Electricity Commissioners shall act in consultation with the Department or Council from which the powers were transferred. Clauses appear as to overhead wires and wayleaves.

The following clauses referring to the supply of apparatus and the limitation of prices and profits are interesting:

> A district electricity board and any local authority authorized by Special Act or by Order to supply electricity may provide, let for hire, and in respect thereof may connect, repair, maintain, and remove (but shall not, unless expressly authorized to do so by the Special Act, manufacture or sell) electric lines, fittings, apparatus, and appliances for lighting, heating, and motive power, and for all other purposes for which electricity can or may be used, and with respect thereto may demand and take such remuneration or rents and charges, and make such terms and conditions as may be agreed upon.
>
> Any electric lines, fittings, apparatus, and appliances provided by, or on behalf of, any authorized distributors on consumers' premises, either before or after the passing of this Act, and any lands, buildings, or works held by them in connection therewith, shall be deemed to form part of the undertaking authorized by the Acts or Provisional Orders relating to such authorized distributors.
>
> The prices charged by a district electricity board for electricity shall be fixed by the Board subject to the approval of the Electricity Commissioners.
>
> In addition to any provisions contained in any Special Act or Order limiting the prices to be charged by authorized undertakers in respect of the supply of electricity, the Electricity Commissioners may regulate such prices with a view to securing that the benefit of any reduction in the cost of electricity or in the capital employed in the production thereof attributable to the provisions of this Act shall inure to the consumers.

The provision by the Treasury of 20 millions sterling—if needed, and which will be repayable by the District Boards or Joint Authorities—continues in the Bill. This money is for the construction of works and for the purchase of land during the transitory period.

Authority is given to the Electricity Commissioners to empower the District Electricity Boards to raise money; and later on it is seen that the Electricity Commissioners may lend on such terms and conditions as, subject to the approval of the Treasury, they may think fit, to a District Electricity Board or any authorized undertakers, any money not exceeding in the aggregate 25 million pounds, which the Board or undertakers are authorized to borrow, if the Commissioners are satisfied that the Board or undertakers cannot raise money on reasonable terms. This sum, with the 20 millions previously referred to, means a provision of 45 millions through the Treasury—of course repayable and all assured.

Any excess of expenditure beyond the receipts (the source of which is not clear) of the Electricity Commissioners is to be apportioned among the District Boards or Joint Authorities and the authorized electricity undertakers of the United Kingdom. But during the first five years after the passing of the Act, the excess is to be paid out of moneys provided by Parliament. Such payments, however, are to be treated as advances, and are to be repaid, with interest, during the next succeeding three years.

Authorized undertakings are empowered to pay subscriptions to Associations which are run in the common interests of the industry. There are many other provisions, one of which provides for the application of section 4 of the Conspiracy and Protection of Property Act.

TRANSFER TO THE MINISTRY OF TRANSPORT.

From the Bill the clause transferring the powers of the Board of Trade to the Ministry of Transport was deleted by the Committee; but when the report stage was reached in the House on Thursday last, Mr. Shortt moved its reinstatement. There was a good deal of discussion upon the motion. It was pointed out that to be brought under the Ministry of Transport would be very unpopular in the electricity industry; and as the Ministry of Transport would be a great user of energy, it would be looked upon in the light of a competitor with other users. Judging from remarks by Sir Auckland Geddes, the Board of Trade are quite willing to part company with electricity, and hand the work over to the Ministry of Transport. From an observation made by Sir Fortescue Flannery, it seems that the Association of Electric Supply Companies (which represents over a hundred companies) are favourable to the transfer. The House appeared generally in accord as to the Ministry of Transport having control, and so the clause was re-instated. The electricity supply industry, or its greater part, will again look upon itself as a sort of appendix to the new Ministry.

ROADS AND PUBLIC WORKS EXHIBITION.

THE County Councils Association have organized (in connection with a congress) a thoroughly practical show, in the Roads and Transport Exhibition, and the Municipal Agency, Ltd., in the Public Works Exhibition, which, as a combined display, will remain open at the Royal Agricultural Hall, Islington, until Thursday of this week. The titles are, of course, comprehensive, and the exhibits are consequently of a very varied nature; so that there is much which cannot fail to appeal to anyone connected with the work of local authorities. The exhibition is, in fact, on somewhat similar lines to that of 1915, but more extensive.

Road making materials take a prominent place; and there are motor wagons and vehicles for all the purposes that a local authority have to serve. Asphalt products of different kinds and "Mexphalte" bitumen for road construction are shown by the Anglo-American Oil Company and the Anglo-Mexican Petroleum Company; Tarmac, Ltd., draw attention to their special material for road construction, which has been on the market for nearly twenty years, and is made of selected blast-furnace slag; and the Townmead Construction Company, "Westrumite" liquid asphalt. There are tar boilers, and other appliances; and Messrs. Stothert and Pitt, Messrs. Ord and Maddison, and Messrs. H. J. West & Co., and Winget, Ltd., show different forms of concrete and tar macadam mixers.

Another important section of the exhibition is that which relates to concrete construction. "Triangle Mesh" (which is made of cold drawn mild steel wire) and indented steel bars, for use in the reinforcement of concrete are displayed by the Indented Bar

and Concrete Engineering Company; the "Lattice" system, by Johnson's Reinforced Concrete Engineering Company; expanded steel sheet reinforcement, by the Expanded Metal Company; and "Trussit" for concrete walls, by the Self-Centering Expanded Metal Works. Vislok, Ltd., exhibited their safety lock-nut, which is claimed, from long experience, to defy the most continuous and intensified vibration; and another lock-nut which is said to be absolutely and permanently secure, however exacting and rough the conditions may be, is that made by the Ross Locknut Company. The National Benzol Association take advantage of the opportunity afforded to draw attention to the advantages of benzol as a motor fuel; Messrs. Major & Co., to their wood-preserving stain "Solignum;" and the Middlesbrough Slag Company, to tar macadam made by them.

PARKINSON STREET-LANTERNS AND BURNERS.

There is only one exhibit directly relating to gas; but it is a good one—by Messrs. Parkinson and W. & B. Cowan, Ltd., of Bell Barn Road Works, Birmingham, who have on their stand a number of street-lamps in lighting, the brightness of which is such as to suggest high pressure, rather than the low pressure at which they are supplied. There are a number of features in the firm's display; and some of them may be briefly noted. In the first place, there are pre-heated single or cluster inverted burner lanterns. With this pre-heating, it is claimed that there is secured at least 25 p.ct. more efficiency from an illuminating power point of view than when using an ordinary burner. Another important point about this series of lamps is that the gas and air adjustments are on the outside, which enables adjustment to be carried out under normal conditions. There are also pre-heated upright inverted burners and clusters, fitted with gas and air adjusters and "Noncrac" nozzles, to take different types of mantle. This upright inverted burner is intended to take the place of the "C" burner, giving, it is said, with a consumption of 2 c.ft. of gas, an illuminating power equal to that of a "C" burner with a consumption of 6 c.ft. The "P.-L." momentary flash bunsen bye-pass cock, is a useful little contrivance, which is operated by an ordinary torch. The lamplighter turns the cock beneath the lantern, and the insertion of the torch through the door operates the flash, which is turned off again by the act of the lamplighter in withdrawing the torch. Actual test has shown the consumption of this flash, used nightly, to be 5 c.ft. per annum—compared with a consumption of some 2000 c.ft. by a ¼ c.ft. ordinary constantly burning bye-pass in the same period. One of the lamps on the stand is shown fitted with an automatic controller; and they can be adapted to any type of appliance of this character, operated by either clockwork or pressure. Coming back to the pre-heated upright inverted burners, it may be mentioned that Messrs. Parkinson and Cowan have placed upon the market a direct-action gas-adjuster. Inverted burner conversion sets can be supplied complete for fitting into any old type of lamp—square, round, or hexagonal. With these, the improvements just mentioned can be embodied—the pre-heated burner and the direct-action gas-adjuster, with air-sleeve below the reflector. Another thing worthy of the attention of a lighting authority is an acetylene torch, to replace the ordinary oil type. This torch generates its own gas, and 1½ oz. of calcium carbide will give a 1-in. flame for 2½ hours, which is longer than is taken by the usual round of a lamplighter. There is a new series of gas arc lamps, with pre-heated burners and outside gas and air adjustment, and another of similar type provided with a U fitment for fixing on street-columns. There are also swan-necks and harps designed on elegant lines. All the patterns are of the substantial make their hard life demands.

Another portion of Messrs. Parkinson and Cowan's stand is devoted to gas-fires and hot-water appliances. Here is to be seen the patent "Conrad" gas-fire, built on the principles explained by "Lemaro" in the "JOURNAL" a few weeks ago [Oct. 21, p. 126], which are stated to result in the maintenance of approximately 20 p.ct. greater temperature rise. There is the "New Cottage" water-heater, as well as geysers of various patterns, suitable for a variety of purposes.

EFFECTS OF SCIENCE UPON INDUSTRY.

THE Opening Meeting, last Wednesday, of the new session of the Royal Society of Arts was the occasion of an address by Sir HENRY TRUEMAN WOOD, M.A. (Vice-President and Chairman of the Council), on "Science and Industry." He said that, as it was the need for the better organization of industry that led to the foundation of the Society more than 160 years ago, and as the Society has ever since its foundation taken its full share in the promotion of industrial progress, it had occurred to him that the reconstruction of industry and the effects of science upon industry would form suitable subjects for consideration.

His lengthy review of past facts as bearing upon present circumstances was followed with close attention. It was shown that humanity has had evil experiences before this, and that the threatened results of past wars have been regarded with apprehension equal to any we now entertain as to our future prosperity. Yet within a few years after Waterloo, England was stronger, richer, and more prosperous than she had ever been before. Her commerce was extended, and her industries increased. What has not been accomplished in the century that has elapsed since then? The attention of the audience was drawn to many directions in which science and industry have of late very rapidly progressed.

One of these directions was coal mining. A hundred years ago, said Sir Henry, the great industry of coal mining was in a state of rapid development. The demand for coal was increasing at a cumulative rate. First, came the demand for fuel for the boilers of steam-engines. Next, the substitution of mechanical for animal power caused great multiplication of machinery; and the iron needed for the construction of the machines necessitated for its production the consumption of coal. Then the extending use of gas for lighting involved the supply of large quantities of coal, to say nothing of the steady increase of the domestic consumption of coal. The demand was met by the opening-up of fresh coalfields, and by carrying the workings to greater depths; and in both cases the extension was rendered possible by the knowledge provided by the young science of geology. It was the information contained in the maps that the Society in 1815 helped William Smith, the "Father of British Geology," to publish, that enabled the coal measures to be located with certainty beneath the overlying strata. The increased depth, and the extension of the workings, added greatly to the difficulties and the dangers of mining coal; and these were met, not only by improved ventilation and by better mechanical arrangements for bringing the coal to the surface, but also by the safety lamp—an invention which was almost certainly the earliest instance of the application of pure scientific induction to the provision of a desired practical result. Again, a century ago it may be said that the foundations of chemical industry were only being laid. As regards dyes, matters were much in the same condition as when the Society started its career by offering prizes for madder and cobalt; and another generation had to pass before there was found, in Perkin's synthetic dyes, any substitute for the ancient materials which served our forefathers.

Emphasis was laid by Sir Henry upon the fact that during the period to which he referred all our progress was accomplished by individual action—not by State organization or control. There is, he went on, still room enough and to spare in this country, both for the introduction of new industries and the development of old ones. The great and successful efforts which have been made to establish in England the manufacture of dyes are well known; and there is every reason to believe that in the future we shall be able, if not to supply all our requirements, at least to compete on equal terms, in our own markets and in the markets of the allies, with those rivals who once held a practical monopoly of this great industry. So with other things. Our advance has been much too slow; but we have had a rude awakening, and the process seems to have been effective. So far as the application of science to industry is concerned, the nation is thoroughly aroused. In this connection, the formation of a Government Department of Scientific and Industrial Research was referred to. The greatest problem now facing us in industrial science is, Sir Henry declared, the provision of new sources of power. What is really wanted is not a new source of energy, but some means of controlling, and so utilizing, forms of energy already well known. In dealing with this matter, he quoted Sir Dugald Clerk's calculations that the best steam-engine in 1914 utilized 16·8 p.ct. of the theoretical energy in the fuel, and the best gas-engine 28·4 p.ct. The limiting efficiencies which appear to be the highest possible with our present knowledge—that is theoretically possible with engines designed but not yet constructed—are given by Sir Dugald as for the steam-turbine 28 p.ct., for the internal combustion-engine 46 p.ct.

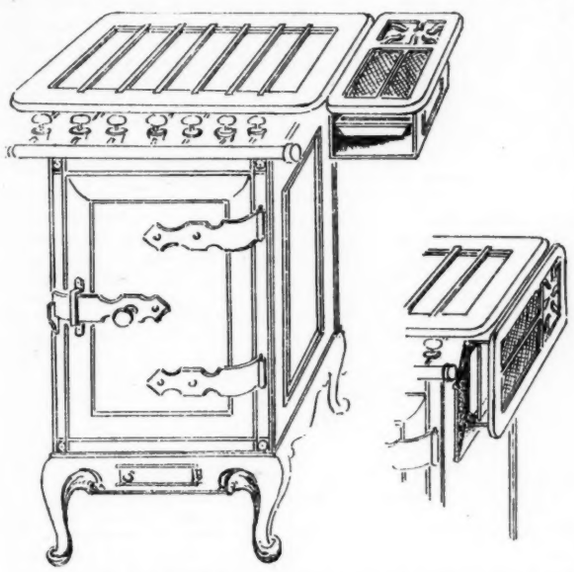
COOLING EFFECT OF CARBON DIOXIDE IN FLAMES.

SOME weeks ago, there appeared in "Engineering" an article in which Major W. T. David, M.A., Assoc.M.Inst.C.E., showed that, by the substitution of carbon dioxide for nitrogen in the mixture fired in the explosion chamber of an internal combustion engine, the temperature attained was lowered in a remarkable degree [see "JOURNAL" for Sept. 23, p. 672]. It will be seen that he suggested then that the vibratory degrees of freedom of the inert carbon dioxide molecules rapidly absorbed energy from the freshly-formed molecules which are known to possess at the moment of formation a considerable excess of vibratory energy over and above the amount which they would possess under equilibrium conditions corresponding to the gas temperature. Returning to the subject, "Engineering" says that, if views recently brought forward by M. Perrin (the distinguished French physicist) be well founded, there would seem reason to believe that the remarkable lowering of temperature effected by admixtures of carbon dioxide is really due to dissociation of this gas. M. Perrin contends that every chemical reaction is provoked by luminous radiation. The velocity of the reaction is determined by the intensity of this radiation, and only depends on the temperature in so far as the intensity of the radiation depends on the temperature. The writer says it is generally acknowledged that when two atoms combine chemically, the rate of radiation is far greater than it would be from the compound molecule raised by external means to the same temperature; and if M. Perrin's view be correct, the dissociation of the carbon dioxide in Major David's explosion vessel should be far more than that corresponding to the temperature of the mass of gas.

COOKER WITH REMOVABLE OVEN-GRILLER.

WITH the object of enabling the oven of a gas-cooker to be raised sufficiently off the ground to obviate the necessity for stooping to see inside, and at the same time of avoiding the placing of the hot-plate on a higher level, a new type of cooker has been designed in which the usual space between the crown-plate of the oven and the hotplate has been greatly reduced. In this way, not only can the oven be raised to a comfortable extent, but there may be even a slight reduction in the height of the hotplate from the ground.

The reduction in the space between the cooker crown-plate and the hotplate has been made possible by dispensing with the grilling burner as ordinarily fitted. The new arrangement permits the advantage to be enjoyed of an additional boiling-burner on the hotplate; and it also provides a separate oven for economically cooking small quantities of food. The oven-griller may be made movable on and off the cooker as desired; in which case, so as to lessen the weight, the frame and top (or top only) can be of cast-iron, and the sides and back of sheet iron or aluminium, or the



whole may be of aluminium or other light material. As an alternative, instead of being placed on top, a griller may be attached to the side of the cooker, in such a manner as to allow of its removal to save space when not in use, or it may be hinged to the side of the hotplate. In this case, in addition to the extra boiling-burner on the hotplate, a still further boiling-burner can be provided at the back of the portable or hinged griller. This griller, too, can be made in the oven form, which would be collapsible for fitting against the side of the stove when not in use.

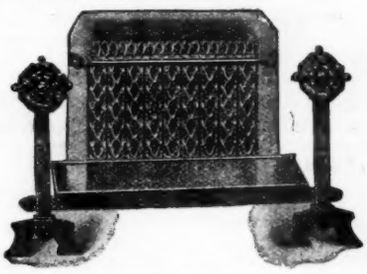
The suggested cooker improvements here referred to have been brought to our notice by Mr. H. A. Wall, of "Cobdene," Commonside East, Mitcham.

THE INSET FIRE.

WHILE the ultimate aim of everyone interested in gas heating is to achieve the ideal type of gas-fire which will entirely eliminate the production of the ordinary coal-grate, there are yet two important factors to be faced and borne in mind by all practical minds connected with the gas industry—first, that the demand for coal-grates to be fitted into new houses still actually exists, and, secondly, that the problem of adequately dealing with existing coal-grates yet remains to be completely solved. Hence the study of the "Inset" type of gas-fire has always proved a very favourite one with most gas-stove makers since the early days of the grate-fire burner, and none have been more indefatigable in their pursuit of this subject than Messrs. R. & A. Main, Ltd.

The development and success of their now well-known "St. Nicholas" gas-fire of ten years ago—the pioneer of this particular type—was good proof of the practical result of their efforts; but the firm could not lose sight of the fact that there was scope for radical improvement in inset fires of the "upright radiant" type. The subject was already receiving their serious consideration as far back as 1914; but unfortunately the outbreak of war compelled them to direct the whole of their energies to the assistance of the country's needs. One of their first steps on release from active control by the Government was to turn attention anew to this subject; and by concentration of effort they have been able to produce an entirely novel inset fire with upright radiants in time for the present season—aptly named the "Entente."

It is scarcely necessary to indicate that the outstanding defect of inset fires to date is their inability to blend with any ordinary coal interior. This defect has been entirely cured in the "Entente" fire by the elimination of any unnecessary ironwork surround; thus ensuring a brick-to-brick contact between coal-grate and gas-fire, and a complete combination of the two, with the result that the fire, when fitted in position, has all the appearance of being a true integral part of the coal-grate.



The difficulty of varying depths of grate is simply and adequately met by a sliding adjustable trivet, enabling the gas-fire to be pushed right home into the interior. Further, the fire can be fixed at any reasonable level, either direct on the hearth or on the bottom coal-grate, by a vertical adjustment of the two dogs supporting the trivet. While serving this useful purpose, these dogs also accentuate the artistic appearance of the fire, which looks equally well in either the high or low position.

Messrs. Main have given the efficiency of the fire as much serious attention as its fitting qualities and external appearance. A careful study of the integral parts and method of assembly will amply prove this. Brick, burner, injector, and radiants are all mounted on one common base-plate—thus ensuring absolutely accurate registration of all these essential parts. The burner is in itself a complete novelty as applied to gas-fires. Without going here into details of construction, it is claimed by the makers, who are also the patentees, to be entirely in advance of anything yet on the market; and this claim has been whole-heartedly endorsed by those who have so far had the opportunity of inspecting it. The non-lighting back qualities are irreproachable; the method of taking apart is simplicity itself; and, in conjunction with a very simple, yet efficient, injector, yet another new feature evolved by Messrs. Main—an extremely hot flame—is produced, and withal absolutely silent. It may be added that the burner and injector are easily accessible and detachable from the front

of the fire. Still another feature may here be noted. The burner nozzles are not only bored at the outlet, but are also accurately machined on the internal face of the cones—a point worthy of consideration in connection with the efficiency of the fire.

To sum up, the "Entente" fire gives clear proof that though during the war Messrs. Main's productive efforts were devoted to national needs, they have not only been able to keep in touch with the problems of their own business, but have also made good use of their war experience in applying themselves so successfully to the needs of peace.

Manchester and District Junior Gas Association.—There will be a visit of members to the Southport Corporation Gas-Works on Saturday, Dec. 6; and afterwards a special meeting to consider a suggestion that the subscription shall be 11s. per annum (inclusive of a copy of the "Joint Transactions"). The Engineer (Mr. John Bond) has promised to fit-up for the occasion, as far as possible, apparatus for the determination of radiant heat.

SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

A General Meeting of the Association was held last Thursday at the Royal Society of Arts, John Street, Adelphi, W.C. The PRESIDENT (Mr. Frank Livesey, of Maidstone) was in the chair; and there was an exceptionally large attendance of members.

MINUTES OF THE LAST MEETING.

Proceeding to business punctually,

The HON. SECRETARY (Mr. H. C. Head, of Winchester), presented the minutes of the last meeting, as published in the "JOURNAL;" and they were taken as read.

MESSAGES OF APOLOGY.

The HON. SECRETARY mentioned several messages of apology for non-attendance. One was from the President of the Institution of Gas Engineers (Sir Dugald Clerk). He much regretted his inability to attend, as he would have liked to have heard the papers, both of which were on subjects in which he was particularly interested. Several members also sent expressions of regret that they were unable to be present.

ELECTION OF PRESIDENT AND OFFICERS.

The PRESIDENT said it gave him much pleasure to propose the election of Mr. C. F. Botley, of Hastings (who had been Vice-President during the past year), to be President for the ensuing year. They all knew Mr. Botley; and with the work he had done for the gas industry for many years now, they were quite familiar—especially that in regard to the removal of the naphthalene difficulty. Great credit was due to him for this. Many others had copied his ideas; but he thought he could claim for Mr. Botley and his father that they were both pioneers. Those of them who had had business relations with Mr. Botley in the last few years realized that they would have in him a President with a good deal of force and driving power behind him. He had filled important positions on many bodies connected with the gas industry. So he (the President) was sure his election would meet with hearty approval, and, as President, he would receive the support of the members. Aided by this support, his year of office would be a most successful one.

Mr. C. F. FRANKS (Blackheath) seconded the motion, which was heartily carried.

Mr. BOTLEY said he could only hope that health and other circumstances would be such that his office would be fulfilled to the satisfaction of the members, and to the credit of this most important Association.

Lieut. Col. WOODALL (Bournemouth) proposed that Mr. J. W. Whimster, of Bath, be the Vice-President. He had done a lot of valuable work; and they could not have a better gentleman for the office.

Mr. C. V. BENNETT (Rochester) seconded the motion, which was unanimously agreed to.

The PRESIDENT mentioned that Mr. Whimster had been elected Chairman of the Western Section of the Association, so that his election as Vice-President of the Association was singularly appropriate.

THE OLD AND THE NEW HON. SECRETARIES.

The PRESIDENT said the next item on the *agenda* was the election of Hon. Secretary and Treasurer for 1920; and this called for a few remarks with regard to the services which had been rendered to the Association by the retiring Hon. Secretary (Mr. H. C. Head). He became Secretary of the Association in 1913; and members would all agree with him that Mr. Head had done invaluable work. But recently, owing to the increasing number of organizations connected with the industry, he had found the work had become so onerous that he had asked the Committee to accept his resignation. They did so with the greatest regret; but they all felt that he had done such service in the past that it was only fair he should now ask for some alleviation of his heavy duties. It gave the Committee a great deal of anxious thought as to whom they should ask to fill the difficult post of Secretary. Ever since he had been a member of the Association, he had been particularly struck with the very fortunate selections of Hon. Secretaries that had been made. As many of the members knew, it did not matter much who was the President; it was the Hon. Secretary who did most of the work. At the end of his own year of office, he could thoroughly endorse this. Mr. Head had been invaluable to him. The Association had had a succession of Hon. Secretaries in Messrs. Chapman, Helps, Price, Browne, and Head whom he thought could not have been beaten. After a great deal of consideration, and a certain amount of pressing, they had persuaded a gentleman to come forward and accept the office of Hon. Secretary who, he (the President) believed, would be the very man for the position. But before moving his election, it was only right that the members present should record their hearty thanks to Mr. Head for what he had done for the Association.

Mr. BOTLEY (the President-Elect), in seconding, said he agreed that it did not matter much who the President was, so long as they had a good Hon. Secretary. They had been fortunate in their Hon. Secretaries. He remembered the late Mr. Chapman as Secretary; and the efficient ones who had followed him. Mr. Head had been a great success, and a very great help to every President. He (Mr. Botley) had considered very seriously whether he should accept the presidency if he did not have Mr. Head with him as Secretary. But as they had another gentleman coming into the office of whom they had great hopes, he was going to risk it. At the same time, they would expect Mr. Head to do work in other directions.

The motion was carried with applause.

Mr. HEAD thanked the President very sincerely for his kind words, and the members for the way in which they had passed the vote. Honestly he did not think he deserved it. Being Hon. Secretary of the Southern Association was a great pleasure indeed; and as he looked back over his six years of office, he did not think, so far as semi-public business was concerned, he could have had a more pleasant time; and it had been a great and valuable education. Both the President and the President-Elect had said it did not matter what the President was like so long as they had a good Hon. Secretary. The Hon. Secretary might be able to camouflage a bad President, but no Secretary on earth could make a good one. Unless they had a good President—and the Southern Association had had good ones—no Association could advance. The Association had advanced in the last few years; and he asked the members to believe him when he said that it had been due more to the energy, determination, and zeal of the Presidents than to the Hon. Secretary. [Applause.]

The PRESIDENT said as to the new Hon. Secretary, they had approached Mr. W. H. Bennett, of Redhill. He wrote a letter to him, and put the invitation as nicely as he could. Mr. Bennett replied: "If you are as good an engineer as you are letter writer, you are worth £10,000 a year." He (the President) thought at first this was a compliment; but he had since come to the conclusion that it was the reverse. [Laughter.] At any rate, Mr. Bennett was a gentleman who had been particularly honoured by the Directors of the Redhill Gas Company who had appointed him Managing Director. The members were all familiar with Mr. Bennett's work and genial personality, which would bring fresh members to the Association, and assure them of a reception which would make them feel at home. He believed the meeting would be with him when he said that Mr. Bennett was an ideal man for the office. He was personally very grateful to him for having accepted the position.

Mr. W. E. PRICE (Hampton Wick) seconded the motion. He knew Mr. Bennett; and he knew, from personal experience, what he would have to do. It was work that wanted doing by a good man; and the proposal before the meeting gave them a good man for the position.

The motion was very cordially adopted.

Mr. BENNETT thanked all the members for the way they had accepted the proposal. He believed the President would confirm the statement that he (Mr. Bennett) took the office with a great deal of reluctance. When he heard about the attributes of his predecessors, and what was expected of him in the future, it rather made him wish he had refused. However, with the help and support of the Committee, he would do his best. [Applause.]

OTHER OFFICERS.

Moved by Mr. D. T. LIVESEY, and seconded by Lieut.-Col. WOODALL, Mr. J. Donaldson, of Tonbridge, was elected an Hon. Auditor; and on the proposition of Mr. H. BUCKLEY (Windsor), seconded by several members, Mr. W. E. Price was re-elected an Hon. Auditor.

The HON. SECRETARY announced the elections to the Committee. He said the Western District was entitled to nominate two of its members as members of the General Committee. The members appointed were: Mr. J. W. Whimster, of Bath, and Mr. Percy S. Hoyte, of Plymouth. The Eastern District, through its membership, was entitled to have six members. The members appointed were: Mr. J. M. Campbell, of Margate; Mr. H. C. Head, of Winchester; Mr. W. Phillips, of Luton; Mr. L. Trewby, of Mill Hill; Mr. R. S. Tobey, of Horley; and Mr. L. J. Langford, of Tunbridge Wells. This made eight ordinary members of the Committee. Since, however, Mr. Whimster was appointed to the Committee by the Western District, the members of the Association had elected him as Vice-President; and consequently there was a vacancy for another member from the Western District. He presumed that at their next meeting, the Western District would elect somebody to fill the vacancy. The *ex-officio* members were the three immediate Past-Presidents; and for next year they would be Mr. Livesey, Mr. Farquhar, and Mr. Westlake.

Mr. F. W. CROSS (Lea Bridge) made a speech which indicated that he does not particularly like the disappearance of the Commercial Sections and the institution of the Eastern and Western Districts of the Association. Relegating the work of electing the General Committee to the two districts does not commend itself to him; and he also criticized the meagre information given as to the purpose for which the Eastern District was called together that day.

The PRESIDENT replied to the criticism, which showed that what has been done met with the approval of the major part of the members. They had gone to the trouble of reorganizing the large area represented by the Association; rules had been framed

and printed; and so it was the duty of members to read them, and carry them out as well as they could.

A BIG ACCESSION TO THE MEMBERSHIP ROLL.

The HON. SECRETARY read a long list of nominations for membership, which had been approved by the Committee: Mr. W. E. Harris, of Swindon; Mr. J. J. Paterson, of Deal; Mr. Sidney E. Whitehead, of Portsmouth; Mr. F. G. Gorman, of Lower Sydenham; Mr. Clarence Harris, of Taunton; Mr. J. H. Methven, of Bromley-by-Bow; Mr. Arthur C. M'Minn, of Shoreditch; Mr. Herbert G. Colman, of Bradford-on-Avon; Mr. Arthur V. Barraclough, of Aldershot; Mr. F. N. Skinner, of Martock (Somerset); Mr. Harold Higham, of Teignmouth; Mr. Alfred Thomas, of Burnham-on-Sea; Mr. A. N. Carpenter, of Kensal Green; Mr. E. J. Hutchence, of Bow Common; Mr. E. V. Evans, F.I.C., of the South Metropolitan Gas Company; Mr. Richard H. Buxton, of the Wandsworth, Wimbledon, and Epsom District Gas Company; Mr. H. J. Bingham, of Burgess Hill; Mr. F. E. Cox, of Newport (I. of W.); Mr. Charles C. Seymour, of Broadstairs; Mr. J. T. Joyce, of Weymouth; and Mr. Frank Southgate, of Hythe.

Mr. L. J. LANGFORD (Tunbridge Wells) thought such a good list augured well for the future of the Association. He had much pleasure in proposing the election of the gentlemen named.

Mr. J. W. WHIMSTER (Bath), in seconding, said he should like to take the opportunity of thanking the members very much for the honour done him in electing him Vice-President. He would in this capacity strive to do his best to serve the interests of the Association.

The motion was unanimously carried.

THE FINAL COMMERCIAL SECTION REPORT.

The HON. SECRETARY read the report of the Commercial Section (now defunct) for the year ending Sept. 30. It was as follows:

The Committee has pleasure in submitting the tenth annual report for the year ended Sept. 30, 1919.

Membership.—During the year seventeen new members have joined, the total number of members now being 100.

General Meetings.—During the session eleven general meetings have been held in London; the average attendance being twenty-four members. In addition, six meetings have been held in the West of England—at Exeter and Plymouth—the average attendance being twelve members.

Coal.—Deliveries have, generally speaking, been much below the average; stocks are very much lower than usually held; and the quality of the coal delivered has left much to be desired.

Coke.—Coke stocks during the session have not been very heavy, and are now rather below normal. The price of coke has risen in the same proportion as the price of coal, with the exception of the increase due to the substitution of Durham seaborne coal in place of Yorkshire railborne.

Tar.—Prices have been higher than last year. Meetings have been held with regard to an agreement with the tar distillers upon a profit-sharing basis; and it is hoped that tar in future will be sold on this basis.

Sulphate of Ammonia.—The demand for this is still on the increase, due to the propaganda work of the Board of Agriculture and the Sulphate of Ammonia Association. Prices have been better. The subsidy has now been removed by the Government, and the price has been increased to the farmer. The supply of acid has been better, although the price has shown an advance.

Other Subjects Discussed: Coal short weights. Gas Coke Prices Order, 1918. Sale of tar to distillers. Draft benzol scheme. Spent oxide stocks and disposal. Gas rationing. Purification. Rebate on oil. Additional capital. Re-organization of the Western District. Wages, salaries, and hire of meters, cookers, and fires. Extra cost of seaborne coal. Cost of meters and repairs. Acid. Household Fuel and Lighting Order, 1919.

Meetings.—The monthly meetings have been a very great advantage to the members. Officials from the Coal Mines Department—Messrs. Brand and Goodrich—have attended, and supplied valuable information. The Committee regret the meetings were not so well attended as last year; but this is no doubt due to the unsettled conditions.

Re-Organization.—Your Committee had numerous meetings with the Committee of the Southern District Association of Gas Engineers, in order to arrive at some arrangement whereby the two Associations could mutually be joined together for improved working results. The rules and regulations have at length been approved by the Association. The result is that this section will cease its work as a Commercial Section at once. In future the monthly meetings will be held under the auspices of the Southern Association of Gas Engineers and Managers; and it is hoped that greater benefits will result to members attending these meetings.—Signed, on behalf of the Committee,

L. TREWBY, *Chairman.*
R. SEYMOUR TOBEY, *Hon. Sec.*

The report was adopted.

THE DISTRICTS AND THE SENIOR OFFICERS OF THE ASSOCIATION.

The HON. SECRETARY said the question had arisen that morning as to the position of the senior officers of the Southern Association in connection with the Eastern and Western Districts. It was felt that it would be a great advantage if the President, Vice-President, and the Hon. Secretary were *ex-officio* members of the Western and Eastern Districts. It was therefore proposed to bring a resolution before a general meeting that these three officers should be *ex-officio* members of the District Committees; but he did not think it was competent for them to consider this without due notice. As a temporary expedient, therefore, until the matter was formally brought before the Association, the Committee proposed that the President, Vice-President, and Hon. Secretary should act as suggested at once. A resolution would then be brought before the next general meeting.

Mr. A. W. SUMNER (Grays) seconded the motion, which was unanimously agreed to.

PAPERS AND DISCUSSIONS.

Mr. H. J. RANDALL, of York Town, read a paper on "The Admixture of Blue Water Gas and Coal Gas;" and Lieut.-Col. H. W. WOODALL, of Bournemouth, followed with one, entitled "After Five Years." Both papers were discussed. The papers, with reports of the discussions, are published in later columns.

A vote of thanks to the authors was passed; and this concluded the business proceedings.

Tea was afterwards served.

STANDARDIZATION OF TESTING.

In connection with a paper submitted at a recent meeting of the Institution of Petroleum Technologists, Mr. Alexander Duckham wrote a letter in which he suggested that the Institution should appoint a Standardization Committee, whose duty should be to investigate methods of testing, and recommend standards for adoption in this country. At present, he said, in even the simplest tests, carried out on well-standardized apparatus, there will be found to be variations in results in the hands of different operators, due to small differences in manipulation. This matter was again referred to in a paper on "Some Laboratory Tests on Mineral Oils," which was read by Mr. Arnold Philip, B.Sc., at a meeting of the Institution on the 23rd ult. In this the author pointed out that another policy which might be adopted was to standardize the composition of certain representative samples of each kind of material by means of elaborate check-tests carried out by analysts of acknowledged standing; the method of test to be employed being left to the choice of the individual analyst. The standard representative samples of material whose composition had been fixed by these tests would then be available for distribution to chemists for checking their own procedure. This is the method of working which has been decided upon by the Iron and Steel Institute with reference to the chemical testing of iron and steel; and the necessary investigations are now in process of being carried out. A mode of dealing with the standardization of chemical tests, which may, Mr. Philip says, perhaps be described as intermediate between the two just referred to, appears to have been decided upon at a conference held last June by the Institute of Chemistry, to consider the advisability of making provision for the preparation and issue of authoritative samples of chemical substances, metals, &c., of ascertained composition. The conclusions arrived at were that the provision of standard chemical substances was desirable, and that, having regard to the fact that such standards could not be provided without reference to methods of analysis, the scheme should not aim at restricting the choice of methods, but always their revision and improvement. The author is at present hardly prepared definitely to advocate any one of these three policies for the standardization of chemical testing as applied to mineral oils, but is inclined to consider that for any such materials the standardization of methods as proposed by Mr. Duckham will be found necessary.

Oil Production and Conservation.

In round figures, the annual output of coal over the whole world to-day is some 1250 million tons, said Rear-Admiral Philip Dumas, C.B., in a paper which he read last week before the Institution of Petroleum Technologists. All of this is immediately available for fuel, and is presumably used; and as there is some evidence that the quantity is just now falling, the effect should be to enhance the price. In similarly round figures, he went on, the annual output of crude oil is some 75 million tons, of which, at an optimistic figure, 45 million tons can be manufactured into oil fuel. This also is used, and more is wanted. There being thus a far smaller amount, the author argued, it is clear that the value of the oil fuel should be economically based on that of coal; but despite the fact that, from one cause and another, oil has many advantages over coal—he put it as being within the mark to say it is three times as valuable—while coal has advanced in price some 250 p.ct. in the last four years, there has only been a rise of some 100 p.ct. in the price of oil. With regard to the need for taking every possible step to prevent any waste of oil fuel, he pointed out that, as there is only about one-thirtieth of the quantity of coal, from its rarity alone it is a luxury, and, as such, great efforts should be made to conserve it, and save every ounce that is possible. Furthermore, under the ægis of the Institution, experiments should take place in regard to the efficient burning of all sorts of oils. The paper went on to indicate various directions in which waste should be prevented.

Household Fuel and Lighting Order, 1919.—The Board of Trade announce that the Controller of Coal Mines has suspended those provisions of the Household Fuel and Lighting Order, 1919, which limited the quarterly consumption of users of gas and electricity.

AFTER FIVE YEARS' WAR.

By Lieut.-Col. H. W. WOODALL, of Bournemouth.

[A Paper read before the Southern Association of Gas Engineers, Nov. 20.]

In the early summer of 1914, the gas industry appeared to be in the heyday of its prosperity. The reduction of the illumination standard and the removal of other restrictions not only indicated a recognition by Parliament that the gas industry needed, and deserved, greater freedom for development, but opened the way for the application of new methods and for scientific research which had hitherto been blocked by arbitrary regulations.

The British Commercial Gas Association, inaugurated three years before (not without some fears and anxieties), had already more than justified the hopes of its sponsors, and secured for the industry a higher place and a fuller recognition than it had previously enjoyed, had opened-up a vast field for expansion, and had secured for the first time the financial support necessary to enable research work to be undertaken by leading scientists on behalf of the industry.

The future opened-out a broad and smiling vista. Then came the war; and for five bitter years the industry carried on, facing ever-increasing trials and difficulties with steadily decreasing resources of material and personnel—devoting its entire energies to conserving the national resources and assisting in maintaining the forces in the field. How valuable this work was has been little appreciated by the country; but it must have been like water in a thirsty land to many of his audience to hear Lord Moulton's recent generous tribute to the great part taken by the gas industry in the winning of the war.

Through the courage and determination of those in control, the industry weathered the storm; but the armistice found it in a sad plight. New work had been practically impossible during the war; maintenance was perforce neglected; labour, for diverse reasons, was dissatisfied and out of hand; dividends were falling—in some cases to vanishing point; and the whole tendency of wages, coal, and all materials essential for the manufacture of gas was to rise to an unprecedented degree. On the face of it, there appeared every ground for pessimism in regard to the future. But difficulties in the past have provided a spur to greater things; and an appreciation of the position to-day in relation to that of the other great industries of the country affords every reason for hope and encouragement.

So far as the financial side is concerned, the efforts made by the National Gas Council (which in its sphere of guardian of the wider issues and the broad principles of the gas industry surpasses the British Commercial Gas Association in its value to the industry) promise early relief. Further remission of the control of manufacture is also promised; and, granted this, the last bars to progress on scientific lines will be removed, and each undertaking will be free to adopt the form of carbonization best suited to the class of coal with which it has to deal and the class of consumer it is called upon to supply.

In approaching a commercial or an engineering problem, it is always as well to visualize at the outset the ultimate aim for which provision has to be made. We are fortunate in not having to look far for the field of our extension, as a very brief allusion to the glut of figures with which we have been provided during recent months will, I think, conclusively show.

A LOAD TO BE PICKED-UP.

Leaving entirely on one side the wide field for the extended use of gas in the industrial world, two figures in Sir Dugald Clerk's recent paper suffice for our present purpose. The coal used by the gas-works of this country to-day is 20 million tons per annum. The coal used for domestic purposes is 40 million tons. We are all agreed (and architects, doctors, and scientists are with us) that the coal-range and ordinary coal-fire are out of date. Here then, at once, is a load to be picked-up that should at least double the present output of gas. How eager the public are to secure a supply of gas is evident to all gas companies from their fittings returns.

According to the figures supplied by the local authorities, there were in the district supplied by the Bournemouth Gas and Water Company in January, 1919, 27,428 houses covered by the Company's mains. The number of gas consumers on that date was 27,416. Since that date in addition to the large number of fires and gas apparatus sold by local ironmongers (whom the Company assist in every way they can), and apart from cookers and other apparatus let on hire, the Company have sold from their showrooms 1321 fires, 486 cookers, and 212 water-heaters; the value of the total sales amounting to £20,471. More apparatus would have been sold if the makers could have supplied it.

The public are converted to the convenience of gas in the house. What remains to be done is to convince them of the economy of gas for all household purposes. To ensure the economical use of gas, three factors must be practically constant—viz., the thermal value, the specific gravity of the gas, and the pressure at which it is supplied. These are matters to which gas companies cannot give too much attention. The value of a gas supply lies in its ease of manipulation, in its availability for service, and in the freedom from care and worry that it imparts; and any supply that fails to attain these objects will certainly fail to retain the customers it no longer satisfies.

The question of price is a disturbing one. With wages up 120 p.ct., coal up 160 p.ct., and engineering materials up 200 p.ct., pre-war charges would appear hopeless of attainment were it not for the greater freedom of operation promised under new legislation. He is a bold man who prophesies to-day exactly what the new conditions are to be; but in spite of the efforts of the low-temperature carbonizers to introduce methods that provide fancy fuel and 8000 c.ft. of gas as a bye-product, there will be no hesitation, I think, on the part of gas companies in supporting the broad principles laid down by Clegg over a hundred years ago, that a high yield of gas is the most profitable to gas undertakings. Gas possesses not only unrivalled power for the distribution of heat, but also for the convenient utilization of it; and the less solid fuel that remains for disposal on the gas-works the better it will be for the public, provided the price per heat unit of gas supplied is low enough.

So far as gas companies are concerned, Lord Moulton put the case in a nutshell when he said, "As a great distributor of heat in the form of gaseous fuel, the gas industry stands unassailed." That is our strong position; and it seems to me we should be very careful that we in no way depart from it."

We have heard much of new processes and even more of improved carbonizing methods applied to existing plants. One thing is certain—steaming has come to stay. But the steam must be obtained at a proper price, and suitably applied. This means the use of waste-heat boilers and superheaters.

Engineers using waste-heat boilers hesitate to give figures until they have had longer experience, and can state the full advantages attaching to their use. But enough is known to-day to enable it to be said without hesitation that these boilers are thoroughly satisfactory in use, will develop considerably more steam than has been required up to the present time for steaming retorts, and that the waste-gas fans attached to them also work satisfactorily.

COAL.

It is a heart-breaking experience for a gas engineer, who brings all his trained engineering and chemical experience to bear on the problems of carbonization to find his results in no way comparable to those of another engineer using the same plant and apparently bringing no greater degree of skill or enthusiasm to bear on the subject. In no few instances the reason for the widely differing results will be found in the coal supplied.

Until quite recently, the enormous bearing that coal had on problems of carbonizing was not sufficiently appreciated. Any coal that was cheap was good enough for a gas-works, and a very few pence per ton were sufficient to turn the scale in favour of the use of one coal or another. The more carefully this subject is studied, the clearer it becomes that gas companies above all other users of coal should be supplied with the class of coal most suitable to their requirements. The further gas companies are removed from the coalfields, and the heavier the comparative cost of carriage, the more important this matter becomes.

This is one of the questions on which coal controllers appear to have been particularly ill-informed; and the evidence given by one witness before the Coal Commission demonstrated a self-complacent ignorance which augured very ill for the gas industry under Government control, such as he indicated. To him, coal was coal; and provided it was black, even the mixture of soot and pyrites that some companies are receiving hot from the truck, is the same in value and utility as best Yorkshire nuts.

With much of the coal received to-day, steaming is of little use. It sets in the retort solid as a mass of concrete, and steam travels up between the charge and the side of the retort—never penetrating to the heart of the mass at all.

Until control is either ended altogether or exercised in such a manner as to enable gas companies to purchase their supplies in the most suitable markets, the highest results cannot be hoped for, except in the case of those favoured companies on whose doorsteps suitable coal is found. And even they will be lucky if such coal is not diverted to make patent fuel or raise steam for sewage-works boilers in some far-distant county.

Another matter which requires very urgent and careful attention is that of colliery methods. How long is the country to be blackmailed, and coal supplied only at an extortionate price, but of a quality that no self-respecting colliery would before the war have tendered, or gas company have accepted?

The trend of modern carbonizing is towards the use of a clean coal, free from small. Only with such coal can the highest results be obtained. In the interests of national economy and national fuel conservation, it is essential that such coal should be provided for gas companies. It is, in my opinion, the first essential; and I suggest that the National Gas Council, by its own direct efforts, and through the subsidiary assistance of gas companies acting under its direction, should tackle this question at once, and keep on hammering at it until the desired result is attained. One thing must be very carefully borne in mind—viz., that the process of steaming is a radically different one to the old carbonizing methods. Coal that used to be looked upon as a first-class gas coal may not prove the most suitable for steaming and *vice versâ*.

STEAMING.

The attention of gas engineers has been called to a number of recent cases where excellent results are being obtained by small gas-works where steaming of horizontal retorts has been adopted. These results are eminently creditable to the engineers who are obtaining them, but are difficult to secure in works on a large scale. One or two beds of sixes, 8 ft. long, are in the nature of a

laboratory installation; and while as a general principle big gas-works should show higher results than small ones, it has, I think, been found in the gas industry that this is not always borne out in practice, and that a really keen and capable manager can show results in a small works that large works find it very difficult to attain. If anyone has demonstrated the successful use of superheated steam in mechanically operated settings of horizontal retorts, he would be conferring an obligation on the industry by publishing his experiences.

Methods are changing, for which we are all grateful, and the best fuel, labour and carbonizing results are not perhaps found together to-day in any one plant.

An average result before the war may, I think, be fairly taken as:

Carbonizing wages per 1000 c.ft.	Between 0·8d. and 0·9d.
Fuel per cent. of coal	13 to 14 p.ct.
Make per ton	12,000 c.ft.

The following figures obtained on different works during recent months may be of interest. On a considerable sized plant of vertical retorts using wet steam, the men engaged in carbonizing—including wagon-tipping, coal breaking and elevating, all shift work in retort-house, coke handling, screening, and grading to the storage hoppers, retort-house foremen, men for scurfing, and odd retort-house jobs—are as follows per twenty-four hours:

Three foremen.
Six top men.
Three bottom men.
Three conveyor men.
Six retort-house firemen.
Two coal emptying and elevator men.
One man cleaning seal-pots.
Two men scurfing retorts.
One man attending to collecting mains, in consequence of deposits in them since steaming was introduced.

The total daily wages of the above staff are £15 13s.; the average daily tonnage carbonized is 282 tons; the make per ton is 15,800 c.ft. of 442 B.Th.U. gas; the total carbonizing wages equal 1s. 1·3d. per ton, or 0·84d. per 1000 c.ft.

The period of clinkering is now being extended to 42½ hours; and a better fuel figure is to be anticipated. At present, this is 13·21 p.ct. with steaming and 11·41 p.ct. without steaming, with a clinkering period of 36 hours. The make per ton would undoubtedly be increased if superheated steam were used. The gases going to waste up the chimney carry off considerably more heat than would be necessary to generate the whole of the steam required for the settings, if waste-heat boilers were introduced. The above figures demonstrate that, even with the limited knowledge of carbonizing available to-day, carbonizing wages can be brought within pre-war figures.

MAKE PER TON WITH STEAMING.

Each of the following results represents the working at a different works spread over a considerable period:

	C.Ft. per Ton.		B.Th.U.		Multiple.
1	14,700	..	480	..	7,056,000
2	19,800	..	400	..	7,920,000
3	21,000	..	400	..	8,400,000
4	18,411	..	462	..	8,507,000
5	22,190	..	490	..	10,773,000
6	19,700	..	460	..	9,062,000
7	22,990	..	519	..	11,631,810
8	35,400	..	400	..	14,160,000

I need not enlarge upon all these figures. No. 8 is naturally the most interesting; and the following additional figures may be given. The coal used in this particular business yields 10,000 c.ft. of 540 B.Th.U. gas, with a multiple of 5,400,000 without steaming, and has not been looked upon as a good gas coal in the past. The amount of tar and liquor is increased by 80 p.ct., and the coke available for sale is reduced by 25 p.ct.

Another matter of great importance in these days of high capital costs is that, in the particular works in which these results are obtained, the make of gas per retort has been increased two-and-a-half times.

I do not know what the carbonizing wages are in the case of No. 8; but there is no reason why, in a suitably designed plant, the number of men employed per ton should be greater; and this would bring the carbonizing wages down to 0·40d. per 1000 c.ft.

CALORIFIC POWER.

A certain amount of discussion has taken place recently in regard to this; but it does not seem wise for gas companies to prejudice their case by discussions that cannot lead to any definite goal, until such time as they have found out for themselves a great deal more than is known at present in regard to the most economical standard of calorific power for carbonizing and distribution. Gas companies should, however, keep a careful eye on the effect that any serious reduction in calorific power may have on consumers who have installed large plant or apparatus for certain specified purposes. For instance, many people have, on the advice of gas companies, installed gas-engine dynamo plants for lighting business premises, hotels, cinemas, &c.; and companies owe it to their consumers to see that these plants are adapted, or otherwise brought up to date, before reductions are made that might seriously prejudice their businesses.

MAINTENANCE.

The cost of maintenance is almost a nightmare in these days. But here, again, new methods are becoming available. To mention one only, acetylene-welding can be resorted to in numerous instances, where previously castings would have to be scrapped. The acetylene blow-pipe will cut-out tough and heavy plates, and repairs can frequently be executed *in situ*, where previously heavy pieces of plant required to be dismantled and removed for repair. It is, however, essential that properly trained workmen should be available, and that they should have suitable apparatus.

DISTRIBUTION.

In the infancy of gas distribution, the plant available was of an elementary character, and the problem was looked upon as a very risky one. I have seen pipes taken out of London streets that consisted of tree-trunks bored-out, and the ends shaped and fitted one into the other. These pipes were so saturated with gas that the section I had put into the garden at home, after disturbing the harmony of the district for a week was re-consigned to the works from which it came. In spite of its aroma, it probably started life as a water-main, not as a gas-main. It, however, demonstrates what crude contrivances were resorted to in the early days of public utility companies. Our present pressures are a relic of those days; and the sooner we abandon the old costly fetish of low pressure (it might almost be called "no pressure") distribution, the better for all concerned.

Where we are using inches of pressure to-day, we could very well be using pounds. The most satisfactory portion of the Bournemouth district of supply is the neighbourhood of West Moores. The beginning of this district is 4½ miles from the gas-works; the end, some 9 miles away. It is supplied by a 6 in. steel main for the first 4½ miles; a 4 in. steel main for the next 3½ miles; and a 3 in. main for the remaining distance. The services are of ½ in. steel (steam quality) tubing, and connected to the mains by Parkinson's patent tapping gear. Almost every house is fitted with a high-pressure Donkin governor, with a mercurial seal. In some cases, where a number of houses are in close proximity, one governor is placed on a length of main supplying ten to a dozen houses.

A pressure of 10 lbs. is maintained at the works; and this is reduced to 4 in. at the meter inlet. Leakage in this length of main is very rare; and trouble with the governors is practically unknown. There are fewer complaints from this part of the district than from any other, although for economy in pumping the pressure is pumped up to 10 lbs. in the mains, and then permitted to fall to 4 lbs. before the compressors are put to work again. The plant is operated by the governor-house attendant, who also looks after the governors, the holders, and some other subsidiary plant as well.

On the ordinary district, pressures have practically doubled since 1900, and the leakage to-day is lower than it was then. Gas leaves the works to-day at a pressure of 100-10ths in all the trunk mains, as against 45-10ths in 1900. Every service should properly be fitted with a governor; but with the low-pressure prevailing in most of the mains, governors are a source of trouble, and we no longer advise them. If reasonable pressures are maintained, this difficulty would no longer exist. Governors could be installed, and one of the most fruitful sources of trouble and dissatisfaction would be removed.

NAPHTHALENE.

In 1900 the Botley carburation system was first applied in Bournemouth, and has been continued ever since. By its use not only is freedom from naphthalene ensured, but in addition a beneficial effect appears to be experienced by the meters, as up to the present time no sign has been found of the dry and cracked leathers of which a number of companies are complaining.

GAS AND ELECTRICITY.

For many years the relationship with those who should be our good friends, the electrical engineers, has been marked by an acerbity for which no justification exists, and which is much to be regretted. No good purpose can be served by endeavouring to place the blame for this on any particular shoulders; but what is eminently desirable is that present-day misunderstandings should be removed, and that (instead of competing with one another) we should join hands and pool our resources for the advancement of science and the benefit of our consumers.

One hears many suggestions in connection with the super-power stations—including one that they should carbonize coal in bulk and sell gas companies their surplus gas as a bye-product. It does not much matter to us how the result is attained; but it must be evident to anyone who has ever studied the subject that, while the electricians have much that would be valuable to us, the bye-products of our works are more than ample to keep the ordinary town electric generating station provided.

The promoters of the electric super-power stations have so overshot the mark in their chimerical aims and aspirations, that the eyes of the more moderate electrical engineers have been opened to the value of the work that the gas industry is doing, the immense potentialities of the industry, and the impracticability of electricity entering into successful competition in certain fields. Both industries are indispensable servants to the public—each fulfilling a definite place in the life of the nation. The public derive no benefit from our opposition, and would derive very material benefits from our mutual co-operation. Anything that can be done so as to bring these two important industries together must materially assist in the vastly important problem of to-day—the conservation of the fuel of the nation.

The broadened basis of the gas industry, the recognition of the

great part it must bear in the national life of the future, the intimate association of leading scientists and engineers in the proceedings of the technical societies, and the rapidity with which it is being converted from conservative rule-of-thumb engineering methods to keep modern scientific processes—cannot be without influence on gas engineers.

If gas undertakings rise to the great opportunities lying before them, I am convinced that gas can be sold in the early future at a price no greater than that ruling before the war. When this object is attained, gas will be, to all intents and purposes, the only domestic fuel. For industrial purposes, the uses for gas are fast expanding; and gas engineers of to-day have before them opportunities and responsibilities such as, I firmly believe, are not equalled by any other branch of engineering.

GAS ENGINEERS AND THE FUTURE.

We have been very fortunate in the great men who have led our industry; but I think we must all admit that for various reasons gas engineers as a body have not in the past taken a high standing in the engineering world. One of the reasons is perhaps that in each provincial town there is but one gas engineer and only few in the large cities. In the past, our problems have been our own, and little has been heard of gas engineering in the larger Engineering Associations. But even this is changing; and we are all proud that the highest position in the engineering world should have recently been occupied with such distinction by the doyen of the gas industry—Mr. Harry Jones.

The future is in our own hands; the advancement of the industry must come from within; and it is the gas engineer who must (and I am confident will) carry it to the great position that awaits it. We are what we are because of what we have been; and if we are to attain to the only position that should satisfy us—the summit of the engineering profession—it can only be by orderly progression, by keeping ever before us the highest professional ideals, and by being very jealous for the dignity of the great industry to which we are proud to belong.

Lieut.-Col. WOODALL, in two or three asides, stated, with reference to the houses in the Bournemouth area that contained gas appliances, that there were a number of houses, though not a great one, that had two supplies in them. They had, for instance, shops with people living above them. But practically every house in Bournemouth had a supply of gas. In regard to the impurities in the coal they were receiving, it came from the Forest of Dean. It was wretched stuff; and the temperature was sometimes 16 p.ct. higher than atmospheric temperature. At various times, they had had 10,000 tons on fire practically from end to end. When alluding to the steaming of retorts, he observed that the President had referred to a small works that had no calorimeter. He (Lieut.-Col. Woodall) had a report made by a very eminent chemist on experiences with steaming on a small gas-works. He would just quote two figures from it. The make of gas without steaming was 12,940 c.ft. per ton; and when steaming 15,600 c.ft. The calorific power when not steaming was 544 B.Th.U. When steaming, the calorific power went up to 561, though the make was increased to 15,600 c.ft. The reason of this was the protection of the coal gas by steaming. The envelope provided by the steam prevented valuable constituents of the coal gas from being broken-down. Regarding the low calorific power gas (No. 8 in the returns mentioned in the paper), the information was given that with this gas, incandescent burners give a beautiful light, and the gas-fires were perfect. Of course, it was necessary to regulate the appliances to the gas.

DISCUSSION.

The PRESIDENT (Mr. Frank Livesey, of Maidstone) said they owed their thanks to Lieut.-Col. Woodall for the paper he had just read. They welcomed him back to the Association in the spring; and now he had had an opportunity of showing them that, though he had been away on more important work for five years, he had returned with the same old "zip," which wakened them all up and introduced new possibilities to them. He personally was very grateful to him for having come forward in this way at short notice to read a paper. He knew, for private reasons, he was with them at great sacrifice that day. The best manner in which they could show their appreciation of what he had done would be by putting to him all the difficult questions they could think of, and thus promote a good discussion. It seemed to him that the multiple of no less than 14 million odd quoted by the author would take a little bit of beating by the straight coal gas brigade. For the high-pressure system working at 10 lbs., what joints did the author employ; and had he tested his particular district for leakage, by measuring the gas sent out and the gas as recorded by the consumers' meters? Perhaps, also, he might ask what his leakage was, and whether it was corrected. Had he had any experience at all of naphthalene on his high-pressure system; and, if not, could he set it down entirely to the high pressure in itself, or was credit for this also due to the Botley carburation process? Had the high pressure the effect of bringing-down the sprayed oil of the Botley process? Did he condemn the governors on the low-pressure system as a source of trouble simply because they were not wanted, or for some other cause? He (the speaker) was a great believer in the Botley process, if carried out properly. There would be no complaints then; but in his own case it was not carried out properly, and so there were a few.

Mr. C. V. BENNETT (Rochester) remarked that the figures which Col. Woodall had given with regard to steaming were particularly interesting to him, inasmuch as at his Gillingham works he had vertical retorts. The coal he was using at the present time was about 90 p.ct. Durham. For some days, or some weeks, on end it had been practically 100 p.ct.; and he quite agreed that coal of this nature simply set in the retort solid as a mass of concrete, and steam travelled up between the charge and the side of the retort. He had made an experiment to see how long it was possible for a retort to go without being scurfed. As a matter of fact, before it absolutely refused to take the coal at all, it had been at work for twelve months. They found before they steamed that it was necessary to scurf once a month, now they would run quite easily for three months, though as a rule they took them every two months, and had a complete scurfing cycle. Their production of gas was now over 16,500 c.ft. to the ton—it was really nearer 17,000 c.ft.—and somewhere in the neighbourhood of 510 B.Th.U., which would give a total of practically 8,500,000 B.Th.U. The same coal being carbonized in horizontal retorts had produced just about 6,030,000 B.Th.U. to the ton. He noticed the author said that he had found it necessary for one man to attend to the collecting mains, in consequence of deposits in them since steaming was introduced. This was rather peculiar, because in his own case prior to steaming it was absolutely necessary to have a man; whereas since the adoption of steaming just the reverse had been the case—they had had to dispense with the man. They used to find very considerable deposits, whereas there were none now; and in the collecting mains the tar was quite thin. They did regularly put in a rake; but it was very rarely that anything was found. The steam in their case was superheated by passing it through a special tube in the secondary air chamber, next to the first combustion chamber. The temperature there was about 800° Fahr. He would like to know if the author could say for how long the high figure shown in item No. 8 had been attained. It was stated above the table that "each of the following results represents the working at a different works spread over a considerable period." But he did not quite understand whether it meant each of the results or all the results.

Lieut.-Col. WOODALL: Each of the results. They are actual working results.

Mr. BENNETT (continuing) said he presumed the case in which the multiple worked out to just over 7,030,000, referred to practically 100 p.ct. of Durham coal. In regard to inerts, in the ordinary course of working for some months they had been able to keep them down to an average of between 9·4 and 10 p.ct.

Mr. G. M. GILL (London) said he welcomed the paper, as it was one that bristled with interesting points on which everyone could say something. He would like to make a few remarks upon the subject of steaming. Before the war—for his sins—he had about eighteen months selling coke; and he knew from different experiences he had had in competing with coal, that one could only just do it. One either just succeeded in ousting coal, or just failed. Now coke of necessity had about 40 p.ct. more ash than the coal from which it was made; and this in itself always rendered it a difficult problem to compete with coal. Had he had steamed coke to sell in those days, he was convinced that no great success could have been made. Coke, so far as he could see, could not possibly bear any further deterioration than it had already suffered—especially with the coal one got to-day. And it must be that, in passing steam through coke, they were taking nothing from it but the carbon and volatile matter, which meant that the percentage of ash was increased. If they had coal with (say) 14 p.ct. of ash, it meant that the coke would have 20 p.ct. of ash; and if it was steamed, the amount went to well over 20 p.ct. This was a very serious matter. To-day anybody could sell anything that would burn at all. It was easy to sell gas and coke, owing to the scarcity; but when they got back to more normal times, was this steamed coke going to be of any use? Col. Woodall referred to the remarkable result of 35,400 c.ft. of gas per ton; but, in all seriousness, would the coke left after that burn? He also referred to the operations in the retort-house, and the possibilities of working with carbonizing wages which need be no higher than before the war. It seemed to him (the speaker) that carbonizing wages were not the big point in carbonizing that one was sometimes apt to think they were. What was wanted to-day was much better supervision in the retort-house. They all knew of retort-houses where there was perhaps a foreman in charge, and the house got the occasional attention of the engineer, who went in there when he was not busy elsewhere. It appeared to him that, even in quite small retort-houses—say with thirty through retorts—there was a great deal of expenditure of money going on every day. With coal at the high rate at which it was to-day, and coke at the price at which they could now sell it, and upkeep and wages, he made out that it amounted to something like £100 a day for a small retort-house of this size. The amount that was involved in working thirty retorts would come to something like that. Would it, therefore, not pay them to spend £1 or 30s. a day on a proper man to superintend it? With supervision of this kind, he thought one could really start to make good progress. It might be that there were not the men trained to give this expert attention to the retort-house; but if this was the case, it was quite time they set to work to train them.

Mr. G. W. ANDERSON (London), alluding to the result of 35,400 c.ft. per ton, asked whether this was on the coal only, and not upon the coke used in the production of water gas.

Lieut.-Col. WOODALL: The 35,000 c.ft. per ton represents gas made in the retorts only.

Mr. ANDERSON remarked that if they took the amount of coke used, and added it to the quantity of coal carbonized, they would get a less amount per ton.

Lieut.-Col. WOODALL: I mentioned that there is 25 p.ct. less coke for sale than when you are making 10,000 c.ft. per ton. These figures are calculated on the ton of coal.

Mr. L. D. MOSLEY (Croydon), in the course of a few remarks, argued that a good service at a fair price was better than a low-priced article and inferior service.

Lieut.-Col. WOODALL, on rising to reply to the points that had been raised by the different speakers, said he appreciated very highly all the kind remarks that had been made. As to the high-pressure system, the pipes were Mannesmann steel pipes, with ordinary lead joints. When one came to think of it, his own Company in Bournemouth put down on one side of a road cast-iron pipes in which there was water under a pressure of 40 lbs., and on the other side they laid an identical pipe with an identical joint, in which there was 2 or 3 inches of pressure of gas. To put a few pounds of pressure on a main was nothing.

If there was a serious leak, it would soon be discovered, which was all to the good. There were no difficulties whatever, he was certain, in going to pounds pressure. Some engineers had, he thought, in the past been rather afraid that if they changed-over to a really high-pressure system, they would not have the reservoir of their holders behind them. But, on the other hand, they had the exhausters; and if they did not work all the time, the plant would be shut-down. On his high-pressure district, pumping was begun about 1911, and there had never been one solitary failure. There were only two compressors—none too good; and they were worked by gas-engines, and he did not see any reason to anticipate difficulties of this kind. The governors on the low-pressure system they had given up not because they wished to, but because there was not enough difference of pressure between works and district. He did not suppose anybody had not parts of his district in which he sometimes fell to 20 10ths; and if it did fall to this, no governor in the world would give satisfactory results. Many houses originally piped for gas lighting had now gas-cookers, water-heaters, half-a-dozen gas-fires, and various other pieces of apparatus. The gas undertakings did the best they could to strengthen the supply when fitting-up any new apparatus; but often there was found a tendency when one fire was turned on for another to go out. It was therefore essential that there should be a good pressure. On his high-pressure district, they could always give 4 in. pressure to the consumer on the outlet of his meter; and he did not think the consumer was safe with anything less. It was all to the consumer's good, because with a pressure like this he was going to get a decent flame, and not a fitful, flabby thing. It was a very serious matter, and one they should all be giving more attention to. In fact, it was a matter to which they would have to give attention, because under the new regulations they would have to have enough pressure to put sufficient of the lower calorific power gas through their mains. He had been much interested in Mr. Bennett's well-considered and well-informed remarks. This gentleman had given them an account of the formation of scurf on the retort. He (the speaker) had been advised that in the particular case of the 35,000 c.ft. per ton they had no scurf. There was no carbon on the retorts; and this was rather what one would expect. As to the man looking after the collecting mains, the statement in the paper was that given him by the engineer of the works; and as it showed an increased cost, he had to put it in. The vertical retorts alluded to in the paper were by different makers, and of different designs; and he had been authorized to use the figures given. No. 8 was an actual test; and when carrying it out he was advised that they were pretty near the safe limit of heating the retort. It went on for days, and so quite a large quantity of coal was used. But he would like to say that on the works where these results were being obtained, the settings of retorts were settings with obvious defects of design. The bottoms of the retorts were a great deal too cold for steaming. They were designed to give illuminating power. And while the bottom was too cold, the top was too hot, because the gases were going away at about 940° C. The temperatures in the combustion chambers with a big make were something like 1211° C.—that was, about 2200° Fahr. There was hardly anyone present in the room who was not working at least 100° higher, and probably more. In combustion chambers of horizontal retorts, they ran up to 2400° Fahr. Another thing was that these tests were not carried out with superheated steam. At a recent meeting that he attended, an engineer said to him that fifty years ago the late Mr. William Young, in a paper which he read, stated that he could see the day when they would have a make of 50,000 c.ft. per ton, and 1 cwt. of sulphate of ammonia. He thought it was very much to be regretted that William Young did not live a few years longer, because he felt confident they would see what he had prophesied attained within the comparatively near future. There was no humbug about the 14,000,000 multiple. It was the best figure made under conditions which could be improved; and it did seem to him that the future before them was a wonderful one. There was nothing different in this plant from what other people had. It was a plain, straightforward plant, with no "jim-jams," and no special test arrangements so as to obtain academical results. The only thing was that the works had as engineer a trained chemist of great originality of thought, who took constant interest in working conditions, and for whom no detail was too trivial for attention. He had, of course, the advantage that he was only working one setting; for where this was being done he would expect to get the best results. But if only the leaders showed them what could be done, they must be poor engineers indeed if they could not follow them. The coal was washed nuts, and had in the past been looked upon as bad gas-making coal, with a yield, without steaming, of just over 10,000 c.ft.

Mr. BOTLEY: Have you the inerts?

Lieut.-Col. WOODALL said he had asked the engineer in question to let him have the figures quoted in the paper, because he had nothing else to talk about, and he thought the figures would open the eyes of the members and give them something to work for. Though the engineer had given him much more information, it would not be fair to pass it on. He hoped some day the engineer in question would himself tell them all about it, and so get the credit to which he was undoubtedly entitled. Mr. Gill had asked some interesting questions. But he (the speaker) thought that perhaps he overlooked the fact that steaming in retorts was not only a process whereby one made water gas; it was a process whereby one got very much increased results which the composition of the gas showed were not due very largely to an increased make of carbon monoxide. Very greatly they were due to the protection of the gas after it had been made; but in view of these very high results, he could not help thinking much was owing to the penetration of heat to every solitary particle of coal in the retort. His own impression was that the very big makes alluded to were largely due to the fact that hot steam equalized the conditions, carrying heat from the sides of the retort to the innermost part of the charge, so that every solitary particle of coal was subjected to the carbonizing influence. There was this interesting fact, that as the make of gas went up, the make of tar went up the whole time, as also did the make of sulphate of ammonia—showing, he thought, conclusively that they were getting a better form of carbonizing, with protection of the products that were being formed. It had been remarked during the discussion that coke subjected to steaming must be of very much poorer quality. Well, as a saleable article appearances very often went a long way; and, while he had no wish to deceive, steamed coke was a better-looking coke than coke which had not been steamed. [Laughter.] But if one sold a bad article, the results were sure to come back on one's own head, and it did not pay to do it. However, he burned in his drawing-room coke that had been steamed. The grate had a poor chimney draught, and the ash in the coal from which the coke was made ran from 9 to 20 p.ct.; and perhaps this would convince them that there was no trouble in burning it. He saw coke with which 28,000 c.ft. had been made, burning beautifully; and this coke commanded a price higher than that it competed with in the whole district. Then Mr. Gill also said that carbonizing wages did not matter quite so much as proper supervision; that one could afford to spend a little on carbonizing wages, but there must be good supervision. This was very important; and he agreed with Mr. Gill absolutely. If, however, he would refer to the figures given in the paper, he would be pleased to see that the wages included only one foreman for the retort-house on every shift. The figures included three foremen—one on each shift—whose sole duty it was to look after the retort-house.

Mr. GILL: I want somebody in addition to that. I want a foreman on each shift, and a superintendent on day work.

Lieut.-Col. WOODALL: The foremen we have included are solely retort-house foremen. There is a works engineer in this instance and a works foreman as well on the works. The whole of the wages of the three foremen referred to are included in the carbonizing wages. They never go out of the retort-house at all.

Mr. GILL: That does not dispose of my point. There should be a retort-house superintendent as well, whose sole duty is to superintend the retort-house, in addition to the foreman on each shift.

Mr. J. H. CORNISH (Bridgwater), referring to the high figures given in item No. 8, asked whether some portion of the vertical retorts were worked to the total destruction of the coal, and others producing (say) something in the nature of 20,000 c.ft. to the ton. Would it be possible to get the same results as were shown from Forest of Dean or Somerset coal?

LIEUT.-COL. WOODALL replied that every one of these retorts was working equally, with the same amount of coal going through them. As to different sorts of coal, it was impossible to get the results unless they could keep an open charge all through. Immense credit should be given to the engineers who had obtained results such as he had mentioned; but they could not have obtained the results unless they had had the coal to do it with. However, they none of them knew what was the right coal; and it was quite possible that they might find that Welsh coal would do equally as well as Yorkshire, and that they would have to modify their methods. It might pay them to screen coal, put the large through one setting of retorts, mix the small with 25 p.ct. of breeze, and carbonize this breeze and small coal in another setting. There were many ways in which the trouble might be overcome. All they knew was that many of them were getting results to-day which caused them great anxiety, and of which they were none too proud. But scientific investigation, though so of such recent adoption, was making remarkable strides, and should cast a light on carbonizing methods and phenomena that might well mean a revolution on present methods.

ADMIXTURES OF BLUE WATER GAS AND COAL GAS.

By H. J. RANDALL, of Yorktown.

[A Paper read before the Southern Association of Gas Engineers, Nov. 20.]

When I was asked only a few days ago by our President whether I would read a paper on blue water gas, I naturally felt reluctant—first, on account of so many able and excellent papers having already been given on this subject; secondly, as the time was so short, and I had no technical assistant to help me in producing tabulated statistics which would doubtless have proved of interest. However, I was informed that all these considerations would be waived if I gave some particulars of our experience in the mixing of blue water gas at Yorktown.

I wish to particularly emphasize that I lay no claim to novelty in our operations, but as the subject of blue water gas seems to be a topic of interest to those who are undecided on the question of the relative advantages of vertical retorts fitted with steaming arrangements, horizontal retorts similarly fitted, or the production of blue water gas in a separate generator, perhaps these notes may prove of interest to some members.

LOCAL CONDITIONS.

In 1915, when I was appointed, the annual output of gas was 89 million c.ft., and in 1918 it had increased to 124 millions; and, considering this increased output has been obtained in residential and rural districts without any factories of any kind, during a period of strict rationing of gas, the possibilities of additional increases in more normal times are most promising.

This rapid increase, coupled with the uncertainty of regular coal supplies, determined me to advise my Directors to instal a blue water gas plant. It was ordered in May, 1917; but, owing to the exigencies of war, it was not completed until the end of September, 1918, and then only by continuous application to the Coal Controller and Ministry of Munitions.

My reasons for recommending water gas were as follows:

(1) Existing hand-charged retorts were inadequate to meet the maximum loads.
(2) Scarcity of stokers used to shovel-charging.
(3) Rapidity of bringing plant into full action.
(4) Control of coke selling prices.
(5) Less capital outlay.

(6) Bad coal deliveries, necessitating less consumption to conserve stocks.
(7) Lessened costs in manufacture.

DESCRIPTION OF THE PLANT.

After visiting several works where plants had been installed, we decided to place an order with Messrs. Davison and Partner for a plant of a nominal twenty-four hours capacity of 150,000 c.ft. The generator is of the usual type, lined with firebrick, and having blast and gas-reversing valves, is fitted with steam inlets, top and bottom, and also an injecting nozzle fixed at the upper portion of the generator (the steam supply surrounding the injector), so that tar or oils can be admitted on the down-runs to enrich the gas made, if desired. A meter is provided to register the quantity used, and a duplex horizontal pump for pumping the enricher. The gas outlet pipes from the generator enter a hydraulic seal or washer, and the gas passes from this to a scrubber situated outside the building. A steel circulating water-tank is fixed in the generator house; and the water is circulated through a scrubber and washer by means of a horizontal duplex pump. The quantity of steam admitted is regulated by means of the usual metal disc; and a pressure gauge is provided to control the pressure of steam into the generator.

The plant was originally designed for a turbo-blower. But, again, owing to war conditions this could not be obtained; and we were reluctantly compelled to instal a horizontal steam-engine, driving a Sturtevant blower off a countershaft. The blast-pressure is controlled by a steam throttle-valve fitted on the engine, and worked from the stage. The coke is hoisted on to the stage by a hand winch; and a suitable charging buggy, with sliding bottom, is provided for charging the generator.

The plant is blown for about 1¼ minutes, and the gas runs are of 6 minutes duration; the products of combustion passing up through a suitable stack fixed on the charging stage and provided with a sheet-metal guard to protect the operator. The usual working practice is to make alternate up and down runs; but occasionally additional up-runs are introduced to relieve the temperature of the fuel bars. The gas outlet main from the scrubber is connected to a two-lift relief gasholder, throwing a pressure of 6½ ins., and entering this without the use of an exhauster, simply by the pressure of gas generated during the runs.

From the outlet of the holder the gas is brought back to the meter-room, where it is measured through a small station meter fitted with suitable valves. From there it is taken along the top of the retort-benches, where it is raised to a high temperature through contact with the heated brickwork, and introduced at the outlet of the two retort-house governors. The pull on the retorts can thus be controlled, and the quantity of water gas admitted at the outlet of the governors, independently controlled by suitable cocks on the outlet of the water-gas meter. We have tried introducing the water gas at different points between the retorts and the exhauster—such as the inlet of the exhausters, the inlet of the condensers, at the far ends of the foul main, on the inlet to the retort-house governors—but find that, by mixing at the point finally decided upon, we can control the operations much more effectively.

WATER-GAS BUILDING.

The water-gas building, comprising generator house with charging stage and engine-room with store over, is made of breeze concrete blocks of the "Winget" type; and these were made on the works by female labour. As bricks were at the time practically unobtainable, we had some misgivings as to how these would stand the vibration of the machinery; but they have stood the test perfectly, and the building has proved most satisfactory. The capacity of the relief gasholder is 100,000 c.ft., and this is a factor to be considered, as the plant can be more economically worked with a good storage. The boiler is situated adjacent to the plant, and supplies the works generally.

From Oct. 1, 1918, to Oct. 31, 1919, the following tables show the results obtained:

Coals carbonized	8,099 tons
Mixed gas made	139,047,000 c.ft.
Coal gas made	98,697,000 ,,
Water gas mixed	40,350,000 ,,
Mixed gas per ton	17,168 ,,
Coal gas per ton	12,198 ,,
Coke sold per ton	7·5 cwt.

Average calorific value = 437 B.Th.U.

Jan. 1 to Sept. 30, 1918, coal gas only:

Coals carbonized	7,050 tons
Coal gas made	90,487,000 c.ft.
Make per ton	12,835 ,,
Coke sold	8·72 cwt.

Calorific value (no calorimeter at this time).

The analysis of our blue water gas, without any enrichment, is:

Carbonic acid (CO_2)	4·0 p.ct.
Carbonic oxide (CO)	43·0 ,,
Hydrogen (H)	51·0 ,,
Nitrogen (N)	1·5 ,,
Sulphurated hydrogen (H_2S)	·5 ,,

Calorific value = 308 B.Th.U. per cubic foot.

The calorific value of the water gas on the down-runs when using coal tar was 337 B.Th.U. per cubic foot.

I regret that the figures I have been able to give are not more detailed—the short time to prepare this paper has prevented me from doing so.

As was previously mentioned, we have only hand-fired retorts (shovel charged) and consequently the labour charges are high; so that the net cost of coal gas into the holders from Jan. 1 to Sept. 30, 1918, was 30·5d. per 1000 c.ft. The cost of blue water gas, including coke used in the generator and for steam-raising (at selling price), purification, wages, and repairs averages 12·74d. per 1000 c.ft. Added cost of tar enrichment, when used on down-runs (at ½ gallon per 1000 c.ft.) 1·25d. Cost of enriched blue water gas, 13·99d. per 1000 c.ft.

The selling price of gas in 1914 was 3s. 2d. per 1000 c.ft.; and our present selling price is 5s. Considering the high cost of coals and the additional costs in labour, the price compares favourably with works equipped with labour-saving devices and better situated geographically as far as coal supplies are concerned. Added to this is the fact that we are in the unfortunate position of being tied by an Act of Parliament to supply gas to the Royal Military College at Sandhurst at a maximum price of 2s. per 1000 c.ft., and can obtain no redress from the Government. As their consumption in 1918 was 11½ millions, this has consequently raised the price to our ordinary consumers more than it would have been otherwise.

ADVANTAGES.

In our experience, we find that the advantages of using this plant have been that: (1) Properly supervised a gas of good heating quality can be supplied to the consumer, with a low percentage of inerts; (2) a lessened consumption of coal is effected; (3) a saving in skilled labour; (4) lower heats can be worked in the retort-house; (5) less work for stokers, owing to less trouble with stopped pipes; (6) lower wear and tear on retort-settings; (7) a fairly wide range in percentage of water gas in the mixed gas can be made without appreciable effect on the consumers' appliances, so long as good pressures are maintained.

CONCLUSION.

As before mentioned, these few notes are not presented as in any way ideal, but are offered in the hope that they may be of some interest in view of the present transitory stage in which gas manufacture now is, and in which it behoves each one of us to use our utmost endeavours to conserve that ever-rising commodity, coal.

DISCUSSION.

The PRESIDENT (Mr. Frank Livesey, of Maidstone) said the members were indebted to Mr. Randall for having come forward, at short notice, to give them his experience of blue water-gas plant as utilized in works of medium size. In these days, it was very difficult for any of them to make comparisons, owing to the fact that the coal they were obtaining was of such differing quality. Mr. Randall, however, gave them his make of 17,168 c.ft. of mixed gas per ton, of an average calorific value of 437 B.Th.U. gross. This gave a multiple of 7,502,000 B.Th.U. per ton. He was to be congratulated upon this. It was a better multiple than he himself was obtaining at Maidstone with a mixture of 3000 c.ft. of blue water-gas and 11,000 c.ft. of coal gas, owing to the inferior Durham coal he was obtaining. But it seemed to him, and he thought his deductions were borne out by Mr. Randall, that at Maidstone it was essential to sell coke at not less than £7 per ton in order to compete with the alternative process of converting it into blue water-gas. This was rather a striking figure. Those of them who were making blue water-gas at the present time were helping those who were not, by creating a better market for coke. In order to obtain an equal multiple to Mr. Randall's, he would have to make 13,500 c.ft. of 560 B.Th.U. gas, which would be a rather difficult job, the only item on the other side being the coke used in steaming or water-gas manufacture. He had hoped that day to have had the three methods of producing gas fully discussed; but he was not able to arrange for all the papers. He had had some experience with the steaming of horizontals, which was naturally a matter of interest to the smaller works. During the last two months, the gas made per ton at the Cranbrook works had been 14,850 c.ft. He had not been able to send over a calorimeter to test the gas, because the weather had been so bad; and it would have had to be done in the open air. But he thought he might say that the calorific value of the gas was approximately 425 B.Th.U. And it was better gas than was being supplied before, because it was now being diluted with combustible gas low in inerts, whereas before in many of the smaller works, the gas had been persistently diluted with furnace gases. There was one other reference he should like to make to the paper. He saw Mr. Randall had been utilizing breeze concrete blocks for his buildings; and they were made on the works by female labour. He was to be congratulated on having taken a step of this kind. On a small works, it needed a great deal of enterprise to go in for manufacture of the kind. However, he (the President) believed there was a great future for breeze blocks. He was talking only the other day to a member of a Housing Committee, who said that over bricks and mortar thousands of pounds were being thrown away; and he was convinced that houses should be built with hollow walls of breeze blocks tongued and grooved. He (the President) endorsed this opinion, because breeze blocks had the advantage of porosity. He noticed Mr. Randall had not told them what coal he had been obtaining. But from the figures it was clear he had not been having to deal with "modern" Durham coal, which some of them had been receiving. On this he was to be heastily congratulated.

Mr. C. F. BOTLEY (Hastings) said the paper was a very pertinent one at the present time; and it tended to brush one's memory up with regard to one's own practice. He should like, in the first place to sympathize with Mr. Randall on the extraordinary position he was in with the Government. [Hear, hear.] That the British Government should take advantage of a small undertaking in this way showed a very bad state of things. It evinced great want of equity; and it explained to them why the gas industry had not received better treatment than it had done. In plain words, it meant that the Government took advantage where they could, and that was unfortunate. It was

extraordinary that, in these times, the Government should protect themselves under the terms of an Act of Parliament. He thought Mr. Randall was to be congratulated on having faced his disastrous burden so successfully. As to the water-gas plant, he noticed in the description that it was arranged for using oil; and most of them who handled water-gas plants believed that it was advisable to have means of carburetting, because with a carburetted plant they were quite able to make blue gas if they wanted to, though perhaps not so efficiently as in a blue water-gas plant specially designed for the purpose. He should like to know if Mr. Randall had used oil at all. Apparently he had not, because he referred to the use of tar; and if tar could be used, it would undoubtedly improve the value of the gas, and a larger percentage could then be used. He believed Mr. Randall referred to the calorific value being improved somewhat by the use of tar. He also mentioned in the paper that he worked into a holder throwing a pressure of 6½ in. If his own experience was worth anything in this direction, he thought that this was unfortunate. He could not think (although apparently it did not appear in the paper) it could be advantageous for the production of gas. A pressure of 6½ in. back on the grate was excessive; and he believed it was disadvantageous to a great production of gas. He (Mr. Botley) would like to have the views of the author on this point. Evidently Mr. Randall found no disadvantage, where he (Mr. Botley) would have expected him to have found a considerable amount. He should have been inclined to have put in some means of exhausting. It was rather difficult with an intermittent pressure; but he believed some benefit would be found from putting in an exhauster to relieve the pressure. There was no figure given for the calorific value of the coal gas. But he had worked it out roughly from the average calorific value of 437 B.Th.U., and made it 507 B.Th.U. He did not know whether this was about right; but the figures given were much in conformity with his own experience at Hastings, where as a rule he used slightly carburetted gas. But he had used blue water gas. His experience, however, had been different from the author's in that he had with blue water gas ordinarily produced considerable difficulties with the consumers. It was due to the air required for combustion. Indeed, they could vary (he was speaking from his own experience) the calorific power very considerably, but they could not vary the mixture with high percentages of blue water gas without causing inconvenience to the consumers. Keeping the proportion as uniform as possible, as well as the pressure, made more difference to the consumer than anything else. Did Mr. Randall use "modern" coal, as the President described it? Modern coal was of varying description; and some engineers had modern coal, which was better than they used to have, although most of them were not in so fortunate a position. Generally speaking, the figures in the paper were much in accord with his own practice; but he did not get up to the multiple which the President had worked out at between 7 and 8 million B.Th.U. per ton. Usually in the case of Hastings, it was over 7 millions under present conditions. With regard to the cost of blue water gas, he did not know whether it would be any information to the members; but it might be of assistance in this matter. He did not, however, want the figures to be taken too critically, because after all they were only academic in the sense that the figures were taken out for his own guidance. He had been working with a mixture of gas, where, of course, so many factors came into play—the price of oil, the price of coal, the price of coke, the market for coke, the price of labour, and so on, relatively to one plant and another. He had been in the habit of regularly taking out the figures on a definite basis—not that it included every charge, but it included all the chargeable factors—so as to see what was the best and cheapest method of working for the mixture to be delivered to the consumers most economically. It might interest the members to know that in September, taking out the figures on this basis in the case of his own works, they found that the net cost of coal gas was 27½d., and carburetted water gas of equal calorific value 33½d. So that for equal calorific value, it was more expensive to use carburetted water gas. The author, of course, had been using blue water gas, which was a different thing altogether; and it would have brought his own cost down to 9½d. if he could have used blue gas. On the other hand, the coal gas might have cost considerably more. The mixture they were sending out cost 29d. per 1000 c.ft.; so that the collateral advantage of the mixture only brought it out slightly more than the initial cost of the coal gas. But they could not have produced the coal gas required—first, because they had not the plant, the men, or the coal; and in following out the wishes of the Coal Controller, those who had water-gas plants were patriotic in using them, although it was decidedly to their disadvantage at the moment to do so, because they could sell the coke; in fact, he could export it at shillings per ton more than he was selling it at in the town. But they must look after the local market.

Mr. L. A. RUMBLE (Reading) said there was one question he should like to ask Mr. Randall. That was whether the retort-house governor was sufficiently automatic to ensure a constant pull on the retorts—no matter the percentage of water gas that happened to be in use at the time. If the amount of water gas varied, it must be looked after, or there would be trouble. The use of tar for enrichment was rather interesting to him. Mr. Randall got 58 B.Th.U. per gallon per 1000 c.ft. when using tar. With Mexican oil it usually ran out to 100 B.Th.U. per gallon per 1000 c.ft. of gas. With the best Anglo-American oil, it was rather more—130 B.Th.U. per gallon per 1000 cubic feet. So that Mr. Randall was only getting roughly about half the thermal value from the tar that they obtained with oil. The tar, however, was much cheaper. The author took it at 2½d. per gallon. This was rather a low figure, taking the present price of tar; and 3d. or 3½d. would be better. But oil was 8½d. or 9½d. per gallon. Therefore, there was not much difference, though at the present prices, carburetting with tar, speaking thermally, was rather less than with oil. One advantage that Mr. Randall did not mention was that, in making water gas separately, the coke for sale was not depreciated in quality, as it was in steaming the retort charges. It appeared from the figures that during one period 29 p.ct. of water gas was mixed with coal gas. The 437 B.Th.U. for the mixture agreed with that, if the calorific value of the water gas was taken at 308 B.Th.U. Taking the figure given in the paper with enrichment, the calorific value of the mixed gas would be about 490 B.Th U., on the basis of 29 p.ct. water gas. Mr. Botley made it 507 B.Th.U.; but he thought 490 B.Th.U. was about right. Per 1000 c.ft. the cost would be 30·5d. for 490 B.Th.U. gas, which was equal to 6·2d. per 100,000 B.Th.U., or "therm." He had taken it that the enriched water gas would cost 12·74d., which was equal to 4·1d. per 100,000 B.Th.U. Therefore the water gas was much cheaper than the coal gas on that basis. He assumed that if enriched water gas was used, the relative cost would be about the same, as in this case the calorific value of the coal gas would be reduced to about 477 B.Th.U. to get the same mixture. At Reading they actually found that, considered thermally, the cost of lightly carburetted water gas and of coal gas was about the same. There was not much difference one way or the other, Of course, as had often been pointed out, the usefulness in several ways of being able to use carburetted water gas was well worth additional cost; and if it could be obtained for the same cost, it was certainly worth doing. Another point which struck him when Mr. Botley was speaking was that varying quantities of water gas or lightly carburetted water gas could be sent out. It had been his experience that, providing they got somewhere about 450 or 460 B.Th.U., they could send out varying quantities of from 30 to 50 p.ct. of carburetted water gas without any trouble on the district.

Mr. RANDALL thanked the members for having given him such a hearty reception to his initial effort. As to the President's remarks. The coal they were using at present was Yorkshire and not Durham. It was owing to the geographical position of the Company that they got this coal. As to the supply of gas to the Royal Military College, they fought very hard indeed to get that altered. The Parliamentary Division had been recently changed. They approached the member representing the division before that event; and they had approached the present member, who was commercially a very active man. He had approached the War Office, and had been assured that nothing could be done, because this supply was embodied in an Act of Parliament passed in 1909, so they were absolutely tied to 2s. per 1000 c.ft. As to the use of the tar spray, they had employed tar; but, as a matter of fact, they were now using creosote. They decided to discontinue benzol extraction, owing to the low price they were getting for it; and they had been using the creosote as an enricher—the creosote which had been used for washing purposes, and so contained a certain amount of benzol. In regard to the calorific value of the coal gas, a test roughly run out was about 498 B.Th.U. As to the percentage of water gas sent out on to the district, if they were going to suddenly put on 40 p.ct. of water gas, they were going to get plenty of trouble. When they increased the percentage very gradually, and the pressure was good (it was no use talking about 15-10ths—their initial pressure was 8½ inches), then there was no trouble. In his experience, they could usually vary the flow of water gas in the mixture between 20 and 30 p.ct. without any trouble from the consumers. He might add as a point of interest that the whole of the cooking for 1000 cadets and officers at the Royal Military College was done by gas; and they would soon hear if there was any trouble.

LOCAL AUTHORITIES AND MAINLAYING.

Public utility companies—such as those supplying gas, electricity, and water—will find much to interest them in the proposals now being put forward in regard to the consolidation and amendment of the highway law under the Ministry of Transport. As legislation is promised on this matter in the not far distant future, it may be well to call attention to what is in the minds of the various county surveyors and engineers throughout the country in regard to the conditions which should attach to the laying of supply mains in public roads; this matter having received some attention at the Roads Transport Congress organized by the County Councils Association in connection with the Road and Transport Exhibition at the Agricultural Hall.

In a paper read at the Congress on Saturday last, Mr. H. Hampton Copnall (the Clerk to the Notts County Council), who is an acknowledged authority on highway law, sketched out the draft of a proposed Bill for consolidating and amending the highway law as it now stands. In this he proposes to give full control to the highway authority over gas, electricity, and water mains. He lays it down that the highway authority shall have full control of the subsequent reinstatement of the road, and have the option either to do the work itself or to require the undertakers to do the work and carry out the reasonable directions and requirements of the highway authority. Where the undertakers do the work themselves, they should be required to maintain the surface which they disturb for twelve months after the final reinstatement.

During the discussion on the paper, it was pointed out that gas and water mains are at present controlled by an Act of Parliament passed in 1847. Mr. Drylands (the County Surveyor of Surrey) contended that public utility companies should be compelled to restore the surface of the roads which they disturb to a condition to carry the traffic, no matter what this might mean in expense to the companies—even if it involved laying the mains in concrete. It had been said, he added, that if this were done, the companies would not be able to get at their mains; but it would not be necessary to get at them if they were laid in concrete. Mr. Martin, of Salford, suggested that there should be standardized positions for the various classes of mains under the roadways; so that damage would not be done to the roads, as was often the case now, in trying to find where a particular main was.

Another matter bearing on the question of mains under highways is the possibility of the building of roads on a different form of construction from that generally adopted at the present time. Great attention is now being paid to the construction of concrete and reinforced concrete roads, many thousands of miles of which exist in the United States and other parts of the world. Though at the moment it may be said that there are differences of opinion between county surveyors on this matter from the general traffic point of view, experiments have been, and are being, carried out by the Road Board; and it is evident that if this class of construction is adopted, it is not intended that the roads should be continually broken-up for laying mains. The view appears to be that special tunnels will have to be made for carrying mains. In any case, public utility companies should watch this proposed legislation.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Annual Meeting.

The Seventeenth Annual Meeting of the Yorkshire Junior Gas Association was held on Saturday afternoon, at the Fuel Department Lecture Theatre of the Leeds University—Mr. E. L. OUGHTON (the President) occupied the chair. There was a good attendance.

ALTERATION OF RULE.

Mr. C. ROPER (Bradford) moved, and Mr. P. M'NAB (Low Moor) seconded, the alteration of Rule 8 so as to read:

> The affairs of the Association shall be managed by a Council, to consist of a President and six other members, two to retire annually.

The change was in the number of councillors and the addition of the last phrase.

The PRESIDENT said it was hoped by this means to overcome any causes there might have been for dissatisfaction. A special business meeting was to be held in December, and would not be open to the Technical Press; so perhaps those who had any complaints would voice them on that occasion.

ELECTION OF OFFICERS.

The election of officers for the coming year resulted as follows:

President—Mr. J. M'Lusky, of Halifax.
Vice-Presidents.—Messrs. G. Dougill, of Heckmondwike, and P. M'Nab, of Low Moor.
Hon. Treasurer.—Mr. C. Roper, of Bradford (in succession to Mr. M'Nab).
Hon. Secretary.—Mr. F. Peel, of Brighouse.
Assistant Hon. Secretary.—Mr. F. Pykett, of Halifax.
Members of Council.—Messrs. W. W. Atley, of Normanton, G. V. Edwards, of Leeds, F. Firth, of Leeds, W. Heathcote, of Halifax, E. A. Leisk, of Leeds, and J. W. Roper, of Bradford.

The PRESIDENT, introducing the new President, said Mr. M'Lusky should have been President last year, but at the time was serving his country. The Association were glad to welcome him back, along with the other members who had served. He hoped the members would give Mr. M'Lusky the same loyal support that they had given to him.

Mr. M'LUSKY, in thanking the meeting, said the provisional programme for the coming session promised an interesting and useful session. There were one or two things of great interest which, in all probability, it would be possible to add in the course of a few days.

VOTES OF THANKS.

Mr. J. LISTER COOPER (Guiseley and Yeadon), in proposing a vote of thanks to the retiring officers, said it was with regret that the members had to accept the resignation of their late Secretary, Mr. Riley, who had suffered from illness. They hoped he would be soon restored to full health.

Mr. E. GARSED, in seconding, said he wished to emphasize the need for the most loyal support of the officers by the members generally.

The motion was adopted.

On the motion of Mr. LEISK, seconded by Mr. PYKETT, a vote of thanks was awarded Prof. Cobb and the University authorities for the use of accommodation at the University on various occasions during the year.

Prof. COBB, in response, said it was a pleasure to be able to meet the Association's need in this matter.

Mr. WALTER HOLE, the Superintendent of the Leeds Gas-Mains and Distribution Department, then gave an address on "The New Times"—see below.

THE NEW TIMES.

By WALTER HOLE, of Leeds.

[An Address to the Yorkshire Junior Gas Association, Nov. 22]

I have taken as my subject "The New Times." But you may ask, Why "new times." In what respect are the times new? We have just successfully concluded a war such as the world has never seen before. That of itself must mean new times. The terrible experiences through which we have passed must mean that as a nation, as communities, even as individuals, we can never be quite the same again. Much more is that true of our industries. The war strained them as they have never previously been strained. In many directions new and wholly unexpected developments took place. Its close has ushered in such a period of industrial turmoil and unrest as this country has never hitherto experienced. The war has left us with bitter experiences and terrible memories of the past, but with great hope for the future. We are standing by the bedside of the birth of a new world. It is being born in pain and distress, with convulsion and upheaval; but to those with eyes to see, and sufficient imagination to visualize, the promise of the future is great. It is not an easy road we are called to travel. There will probably be many tumbles before the new infant "finds its feet." These feet have many a weary tramp before them; but in the end we are confident they will take it to the promised land of a brighter and happier time.

THE OUTLOOK.

The new times will not be easy times. On the contrary, they will be hard, and difficult, and strenuous times. Competition will become keener than ever. Labour unrest will not pass us by. Difficulties with regard to our raw material, already sufficiently great, may easily become greater still. But what then! We are not going to moan over things we cannot help. Rather shall we brace ourselves for whatever the future may bring. In the surmounting of obstacles we develop our powers; and this of itself brings its gratification. There is no sensation finer to a robust mind than the satisfaction realized in the consciousness of a real hard piece of work successfully accomplished. But though the future may be somewhat dark and troubled, there are good broad beams of light already striking through the clouded prospect.

THE FUEL RESEARCH BOARD REPORT.

We start the new times with at least two advantages we never enjoyed before. We have what has fittingly been termed a new charter. There may be particular details on which differences of opinion exist; but taken as a whole, there can be little doubt that the "Report and Recommendations on Gas Standards of the Fuel Research Board to the Board of Trade," especially as recently amended, is to be greatly welcomed. We are anticipating that these recommendations will very shortly be embodied in a Bill, which, in turn, when adopted by Parliament, will constitute a veritable "Emancipation Act" for our industry.

Hitherto we have been crippled by the inflexibility and inadaptability of the conditions under which we have been compelled to work. Whatever their local circumstances and particular needs, every undertaking has been forced into the hard, cast-iron mould of average conditions. Unlike all other traders, the gas industry has thus been unable to develop its business in the way best suited to particular local needs. The absurdity of applying the same standard to (say) Birmingham and Bournemouth, or working on the basis that Sheffield and Southampton are comparable from a gas maker's point of view, will be appreciated by all who have any acquaintance with the vastly different character of the towns. Or look at the question from another point of view. It is elementary knowledge that the coals from the different coalfields in the country differ vastly in character. But however much they may vary, practically the same rigid and unyielding conditions have been enforced throughout the whole country, whatever the coal used. The Fuel Research Board's report, however, changes all this. In place of a rigid uniformity, we see a "promised land" of comparative freedom and elasticity. The article we supply may now be adapted to the particular need of each locality or have special reference to the raw material with which we work within fairly wide limits. What could be more satisfactory and sensible than the finding:

> We are convinced that the desired elasticity is not to be obtained in this direction—*i.e.*, by the institution of a uniform low standard—but rather by so safeguarding the interests of the consumers that each gas undertaking may be given freedom of choice as regards raw materials, processes of manufacture, and quality of gas, so that it may be in a position to meet the needs of the locality most satisfactorily. For each centre of population and industry has its special conditions and environment, which ought to be considered—its distance from the sources of coal, the types of coal which are available, and the outlets which exist for the principal product and its bye-products.

This view has been urged by gas engineers for a generation; and it is satisfactory to know that at last it is to be acted upon.

Then, again, we are to be allowed—nay, rather I might say invited—where local conditions demand or are suitable for it, to supply two qualities of gas. Just as to-day many undertakings have, in addition to their normal low-pressure supply, a high-pressure supply, so we may have, in addition to the ordinary, a low-grade supply. This may mean little in the majority of cases; but where large industrial establishments are thickly clustered round the gas-works, it may mean a very great deal. A high-pressure low-grade supply could be very cheaply distributed in large quantities within reasonable distance of the gas-works, and is certainly a development to be anticipated in the near future.

CHARGING ON THE HEAT-UNIT BASIS.

Among the many other points in the suggested new "Emancipation Bill" are two which have especial interest from the point of view of distribution. The first is the proposal to charge for gas on a thermal basis. Here, again, I think the change is to be welcomed on many grounds. The chief of these is that the charge will be made for that which is useful to the buyer, with a consequential deterrent on the seller from supplying what the consumer does not want. A great deal is being made, as is usual in all such cases, of the possible difficulties with consumers on the one hand, and of the inconvenience of having to use conversion tables on the other. As far as the first goes, the difficulties, such as they may be, are in my judgment in danger of being considerably over-emphasized. In regard to the latter, the inconvenience need only be a temporary one. It would be perfectly easy to construct the indexes of all new meters to register in thousands of B.Th.U. instead of cubic feet. In fact, one enterprising firm has already placed on the market a double index, showing on the one hand a registry of B.Th.U., and, on the other, a registry of cubic feet. There can be no doubt that if we are going to sell on a B.Th.U. basis we shall sooner or later have to register so. We cannot indefinitely sell in one denomination and register in another. That, in my judgment, would be inviting trouble. We must therefore look forward to the gradual displacement of the present index by a B.Th.U. index. This would

involve the inconvenience of two kinds of meter indexes for a few years; but the meters with the old type of index would be a rapidly decreasing quantity, and the trouble would very soon right itself.

PRESSURE.

The other question is that of pressure. The suggested charter proposes that "the undertaking shall, within a period of five years, supply gas at such a pressure that, under normal conditions of supply and equipment, there shall be a pressure of not less than 20-10ths of an inch of water on the gas in any main or service pipe of 2 in. diameter and upwards."

There is no objection which, in the vast majority of cases, ought to be made to this. Everyone knows that with modern appliances there should be a pressure at the point of combustion of 20-10ths to 25-10ths. With regard to gas undertakings supplying colliery districts, where there is often considerable subsidences of the ground, leading to leaky joints and broken mains, and where naturally any increase in pressure must be very closely scrutinized, it is well worth considering whether it would not pay to put in a form of joint at especially dangerous points on the main which would give without leakage the maximum amount of accommodation to such movements, rather than adhere to the open lead or sleeve joint as used at present.

AN UNRIVALLED POSITION.

Then we not only hope to see the Emancipation Bill governing our operations in the near future, but, as a further advantage, we have lately had from some of the foremost scientists of the day a splendid vindication of our position as suppliers of heat energy. I wonder whether we have yet grasped fully all the implications of the pronouncement made a few months ago on the gas industry and coal conservation by such eminent men as Sir Dugald Clerk, Prof. Arthur Smithells, and Prof. John W. Cobb. In order to appreciate it, we have only to imagine the position reversed in regard to our competitors. What a tremendous use they would make—in the present very general demand for conservation of our national fuel resources—of such a series of findings as these: "Gas thus distributes 45 units of heat out of 100 at the gas-works, instead of 7·6 units of heat out of 100 consumed at the central station to produce electricity." Again: "Thus, in the future, gas might be expected to deliver 75 heat units out of every 100, as compared with the 17·6 to be delivered by the prospective electricity superstation." And again: "Except where temperatures above 1700° C. are required, electricity, even in the future, is extremely wasteful of fuel when applied to supply heat. Gas is many times superior in the great mass of heating operations." And yet again: "It is an error to suppose that electricity can economically displace gas for heat, light, and power." If all this is true—and it has never as far as I am aware been disputed—the consequence follows irresistibly that it is only in the widely extended use of gas that the nation's fuel resources can in the most effective way be economized.

But this report is not only from a national point of view a great justification of our position as an industry, it is crammed full of first-class powder and shot for the gas salesman. If only we know how to use it, and to exploit in the fullest way the natural advantages we enjoy, we should very soon see the result in a largely augmented output of gas by all our undertakings.

CONSTRUCTIVE DISTILLATION.

Then the conservation of materials leads quite naturally to a consideration of the wisest use of the nation's resources in manual labour. It has been shown that by the "constructive distillation" of our coal we may get a duty many times higher than that obtained by the roundabout method of taking it through all the stages necessary for the development of electrical energy. It is perfectly obvious, therefore, that for any given piece of work there must be a corresponding economy of men. The less quantity of coal used necessarily implies less labour in mining, less labour in transport, and less labour in conversion.

And if all this is true in relation to our great business competitors when converting in bulk, how much more true it is on the other hand in detail, when considered in connection with the wasteful burning of unpurified gas generated direct from the raw material, coal, upon the domestic open hearth? A far greater proportion of the heat generated in the coal-fire passes away by the chimney than in the case of a modern gas-fire. Therefore here again for any given result in effective work, more men must be employed in mining, and far more proportionately in transport. It must not be overlooked, when considering the domestic consumption of coal, that this has to be transported at least twice—first from the colliery to the merchant, and, secondly, from the merchant to the consumer. If this transit involves a journey by sea, there is, in addition to handling at pit and at destination, the further handling at ports of departure and of arrival. By substituting gas for the domestic use of coal, we eliminate at once all the secondary transport required to convey the coal in detail to individual consumers.

At quite the other extreme from the domestic aspect of this question of transport lies another problem of the greatest complexity—namely, that of pit-head carbonization. It is most probable that the demand for the conservation of national resources, coupled with the exigencies of the situation in other directions, may bring this subject up again for more serious consideration than has hitherto been given to it. The future has undoubtedly great changes in store for the industry; and the wisest man will be least given to dogmatize on this or any other similar subject. Although the problem has many and conflicting factors, it may be simply stated. Taking everything into consideration, would there be any real economy in pit-head carbonization for the gas undertakings situated within a reasonable distance of the coal-fields. Over against the apparent economies and conveniences of manufacture, the possibilities of the working-up and distributing of bye-products and the saving on transport of raw material, must be set increased charges for distribution, &c. And if it can be shown that, starting *de novo*, such net economies would accrue, the further question arises as to the extent our hands are tied in view of the capital already sunk in existing works. As far as transport is concerned, other things being equal, it would be folly to continue to use up rolling stock and manual labour in carrying our fuel supply in solid form from pit to works when the same fuel supply in gaseous form will transport itself, if we give it a big enough push off, and provide a channel for it to travel by. It may, of course, be objected that the present shortage of rolling stock is only temporary, and that it will soon be overtaken. We all hope this may prove to be true. But what we really have to look at is this, What is the easiest and most economical way of conveying the energy represented by so many tons of coal from the pit head to the consumer? It is at least arguable that the transport of the energy in fluid form, as gas, is far cheaper and better than when in solid form as coal. We see the beginnings of such a system in the coke-oven gas supply to some of our districts to-day. But, obviously, if carbonization at the pit-head is to come about in any considerable measure, precautions will have to be taken as regards continuity of supply which at present are quite lacking.

AMALGAMATIONS AND BULK SUPPLY OF GAS.

Closely associated with this question of economy of production are three others—namely, the amalgamation of neighbouring small undertakings, the absorption of small by neighbouring large undertakings, and the sales in bulk from large to small undertakings. The development of high-pressure transmission of gas has rendered feasible a course which, but a few years ago, would have been considered outside the bounds of practical gas politics; and there can be little doubt that the near future will witness considerable changes along these lines.

EDUCATION AND STATUS OF THE GAS ENGINEER.

If the new times and new opportunities are to be used to the greatest advantage, the best brains and the best equipment will be necessary. It is therefore a matter for congratulation that the question of the technical education of the gas engineer is being considered so seriously. As you know, the Institution of Gas Engineers set aside to this very subject a good portion of their valuable time at the annual meeting last May. There is also, as you are probably aware, a small Committee appointed by the Institution to consider and report upon the question. What form the Committee's recommendation may take, it is impossible at present to say; but, personally, I hope they may be fairly drastic. Only such will meet the situation. Up to a point the matter is simple enough; beyond this point difficulties bristle. I sincerely trust that there will be no attempt to evade them. Now that the thing has gone so far, we ought to be presented with a full and well-rounded scheme.

The question of education—speaking, of course, of education in its widest sense—and that of status are very closely interrelated. This is unquestionable. We are all very keen indeed on status. But are we equally keen on the education, which is its preliminary? May I illustrate my meaning? What is the condition of membership of this Association? I have not closely consulted your rules, but I believe it is one of position in the industry. That is to say, a person of good character, occupying any one of a certain range of positions, and applying for membership, would be accepted. Your Committee would conclude—and quite rightly so from the usual point of view—that the mere fact of holding a certain office implies suitability for membership. That is very good so far as it goes. But as I look at the question it is only one out of three qualifications which should be insisted on. The other two are (*a*) a certain standard of general education and (*b*) of technical education. You may or may not agree with me. I am giving you my personal opinion. I am not concerned for the moment in fixing the standard to be adopted. I am arguing the principle.

Now consider how this would re-act on status. The mere fact of membership of such an Association as yours would be a testimonial of ability up to these requirements. It would infer education and technical equipment, as well as the practical ability which occupation of position should imply. In other words, it would confer status to a certain degree. If, then, in addition, the same principle were applied to all our Senior Societies, both District and National, with correspondingly higher standards, the status of seniors would be correspondingly raised. We ought not to rest satisfied until membership of our Senior Technical Associations confers something of the status and dignity which membership of the Institution of Civil Engineers, or Mechanical Engineers, or Electrical Engineers now confers upon the members. But if this is to be accomplished, the movement must begin at the bottom. It can never come from the top. Most of us seniors are past praying for. The future is in the hands of our young men.

But if our industry is to attract the best brains and to insist on a good equipment, it must be prepared to offer a reasonable measure of remuneration and future prospect. In this respect it

has to compete with other fields of service. There are no circumstances that we are aware of in connection with our business which constitute a call upon us for self-sacrifice such as are present in some philanthropic and religious institutions. As far as this is concerned, it is on a purely business footing, and must be judged on the basis of what similar qualifications, character, and industry can command in other fields. The miserable pittances offered in some recent advertisements really constitute a danger and disgrace to the industry, and are certainly a reproach to the advertisers.

There will therefore be general satisfaction at the proposed formation of a Registered Association of Technical Gas Officials. The Association should have a twofold object. It should stimulate and ensure the highest training and efficiency of its members. The effect of this upon their status has already been referred to, and need not be pursued further. The second object will naturally be that of remuneration. Such an Association will quite properly seek to influence the terms offered to, and accepted by, its members. And part of its work in this direction will be to try and prevent men underselling their labour of brain and body in the way which has been only too common in the past.

HOUSING SCHEMES.

The new times are also bringing us new opportunities. During the next few years some hundreds of thousands of houses for our working classes will have to be erected. In some towns a start has already been made. These houses will mainly be of such a character as should provide a great field for gas appliances. It is not too soon to begin to look after this business now. We must commence with architects and building committees while the plans are being drawn. Proper provision for suitable appliances should be secured from the first. In these cases well begun is well done. It is far easier to secure our ends by obtaining a right start than by alteration after a false start has been made. In addition to all other advantages, it has recently been shown that the provision of gas appliances results in great economies in building construction. This is a most important argument in these times of exorbitant charges and scarcity of materials. It should constitute a tremendous lever to move the prejudice and inertia which we so frequently have to encounter. Let us see that we use it to the full.

HEATING APPLIANCES.

And, finally, it is satisfactory to know that the new times are bringing new and better appliances. The curtain has not been fully lifted yet; but even now sufficient is publicly known to stir our interest. The industry has not been standing still during these four years of war. Already many things have been accomplished. We confidently anticipate that the inventive faculty and mechanical resources which have been so largely stimulated in the national emergencies of the last few years, will, in the near future, be still further turned in the direction of the improvement of gas appliances. There is a large field here for cultivation; and it is satisfactory to know that manufacturers are devoting considerable attention to it. Already there are some successes to record, and we look with confidence to a still further advance in the efficiency of domestic and industrial gas-heated appliances.

In conclusion, I must beg you to excuse the discursive character of this address. I have endeavoured to place before you a few of the salient features of the new times, as they appeal to me. They may be put in a nutshell. National interests demand the utmost husbanding of the national resources. As far as fuel is concerned, these resources can best be conserved by the wholesale substitution of gas for coal for domestic and industrial purposes. This gives us as an industry a great opportunity, and fills the future with much encouragement for us. It is up to us to rise to the occasion.

DISCUSSION.

The PRESIDENT said it was customary not to discuss an inaugural address, and he would call upon the meeting presently to give Mr. Hole its hearty thanks. He would like, however, to remark for a moment on Mr. Hole's reference to the need for propaganda work to convince the designers of new houses that gas was a good and an economical thing. It was amusing, though annoying, to read of opinions of officials like the medical officer of health of a North of England town, who had told a terrible tale of the "dangers" accruing from the use of gas in homes by reason of the alleged escape of carbon monoxide poison. Talk of this kind by a few people in the position of such officials as a medical officer showed what an amount of work lay before the industry in getting this nonsense out of people's heads. It was rather a pity that the increased educational proposals were coming forward when so many of the men in the gas industry had passed the age of 35, and who, for this reason, or owing to family responsibilities, were unable to tackle technical training with the fullest keenness. It was, however, very necessary that some decision should be come to quickly as to what was the proper training of a gas engineer. In many cases a man obtained a position as engineer when he had no real qualification, and had not had proper opportunity of acquiring engineering knowledge. There was too great a modern tendency to make the general manager top dog, forgetting that business organization—essential as it was in its own sphere—was not the be-all and end-all of gas production.

Mr. HOLE suggested that he would much prefer to take the vote of thanks for granted, and hear some discussion on the address, even if it meant a departure from custom. Indeed, he had purposely put some things in provocative form to arouse comment.

Mr. LEISK said Mr. Hole had said that, under the new system of supply by heat units, they would not need the great uniformity of the past. He meant, of course, that it need not be uniform throughout the country. If it was not going to be uniform in a given district it would be a step in the wrong direction, because variation in quality in a district would lose them more custom than any ordinary competition. If the quality of gas coming forward made a sudden jump to even better quality, the consumer would not get the benefit, because his appliances would be put out of adjustment. If the leaders in the industry wished to encourage technical education, they could best do it by offering proper salaries to gas officers. He trusted Mr. Hole's remarks on this point would reach some people in authority.

Prof. COBB congratulated Mr. Hole on the character of his address. The extensions of privileges to the gas industry resulting from the new regulations were of enormous importance, but could only really be made a success by the industry assuming its own responsibility in the matter. This was that, whatever grade of gas was to be supplied—and that might vary within considerable limits—it was regarded by everybody concerned in the introduction of the new regulations as of the greatest importance that any standard accepted must be adhered to the utmost degree of closeness. There was no possibility of this large range of gas quality and composition being made the working success which was necessary for the satisfaction of the industry and the consumer unless this was borne in mind and acted on to the full. This would include the maintenance of quality, of pressure, of appliances, and of all that was concerned in seeing that the consumer received a constant amount of heat units within a given time, so that his appliances would go on regularly in turning out exactly the same heating or lighting effect. Permission of variation did not mean permission of variation from time to time—very much the opposite.

Mr. OUGHTON said that, speaking as the representative of the Association on the Sub-Education Committee, members would have the need brought before them. They were greatly indebted to Mr. Hole for the lead he had given that day.

Mr. J. LISTER COOPER said he was glad to hear Mr. Hole give his blessing to the new "charter" of the industry which gave freedom to supply gas most suited to the circumstances of the district, though it must follow that the gas must be uniform. They were all looking forward to the Bill which the Government were to bring in. They were thankful for the report of the Fuel Research Board, and looked forward to the removal of many restrictions which had hitherto handicapped the industry. Pit-head carbonization would no doubt reduce the capital necessary on small district works. But he could not help thinking that, in the event of anything of the kind, it would be necessary to gasify the coke as well; and they would have this to transport. Perhaps the time might come when they would supply all coke-oven gas, and then they might better talk about pit-head carbonization. He moved a vote of thanks to Mr. Hole.

Mr. GARSED said he was particularly interested in the clever way in which Mr. Hole had linked-up what he described as the wholesale conversion of gas supply with the labour problems which to-day faced the country.

Mr. J. W. LEE (Chesterfield), in seconding the vote of thanks, said he was proud to be still a member of the Yorkshire Junior Association, though he was now more closely identified with the coke-oven industry. The address had struck him as being just the right thing from an old hand in the industry to the young men—full of optimism and grinding thoughts as to the future. He had himself recently given voice to the opinion that the time was coming when the whole of the Associations dealing in any way with coal carbonization—whether senior or junior, gas engineering or coking, or in other branches of coal carbonization—would have to come into much closer touch with each other, in order that coal should be used in the most economical way in the national interest. The time was coming when they would not have to talk about their competitors as the "enemy," but to recognize that there was a place for the electrical engineer in the national economy in the use of coal, and that they and the gas engineers alike were all rendering an efficient national service in peace, just as many of their members did in war. The days ahead would not be easy, but Mr. Hole had rightly spurred-on the young men and reminded them that difficulties were there to be overcome, and this lay along the line of better equipment of technical training. He did not wish to unduly criticize, but it did seem to him that there was too much desire among some of the younger men to take the short cut.

Mr. P. M'NAB said they all felt that the address of Mr. Hole had been most valuable, and that it gave to the members an ideal worth striving for.

The vote of thanks was adopted.

Mr. HOLE, in response, said it was a treat to speak to the Yorkshire Junior once again after an interval of eleven years since he had before given the inaugural address of a session. Mr. Leisk had raised a question as to the uniformity of quality of gas. Well, of course, he himself had, year in and year out, urged the point that, for the welfare of the industry, two things must be kept in mind—uniform quality and uniform pressure so far as this could reasonably be attained. It did not matter so much within reason what the quality was, so long as it was uniform. It would do no good to the industry if consumers had to adjust their incandescent burners three or four times in an evening. It was bad enough for an engineer, who was quite *au fait* with the trouble, to have to do this. In regard to the basis of membership of an Association, what a fine ideal it would be for the Yorkshire Association to set the pace in this matter and take the lead. As to "the enemy," they must all admit that there was a place for electricity. What they did not like, however, and had every right to object to, was the attitude of mind which was taken up by so many electrical people, who coolly held that gas was a "back number," and that nobody had any right to think in terms of anything but electricity. There was room for both; and if they would both cultivate their own natural fields, they need not get to loggerheads. On the question of education and status, there was no victory without dust. They must go through the mill—there was no short cut to success. The young men must face that at the very outset. The great curse of the present-day young men in all industries was a desire to start where their fathers left off. They were rather averse to taking off their coats and fighting for the position as their fathers had to do.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held at the Council House, Birmingham, last Thursday, when a couple of "Paperettes" on "Scientific Instruments on Gas-Works," and "Power Plant on Gas-Works," were read by Mr. J. H. GEE, B.Sc., A.I.C., of the Central Laboratory, Birmingham, and Mr. A. H. MILLS, of the Nechells Gas-Works. Mr. C. CARRINGTON BARBER (the President) occupied the chair.

SCIENTIFIC INSTRUMENTS ON GAS-WORKS.

Mr. Gee discussed the uses of some of the scientific instruments which enter into the everyday life of the routine side of a gas-works; and classified the instruments selected under the following headings: Those concerned with calorific value; those dealing with gas analysis; those used for specific gravity determinations; and those required for the estimation of temperatures. Instruments concerned with the calorific value of gas were more important than ever, because the candle power basis of selling was almost entirely replaced by one of calorific value. The time would soon come when the actual units figuring on gas bills would be changed from cubic feet to B.Th.U. The instruments commonly used for the estimation of these fundamental units were representatives of the flow-type of calorimeter, the Junkers, and the Boys. To obtain accurate results, there must be a regular flow of water from an overhead tank of sufficient capacity (at Nechells, one of 50 gallons capacity, with ball-cock feed from the town supply, and an overflow pipe was used); and the water must be kept at the room temperature. An error of 8 to 10 B.Th.U. in favour of the gas might easily arise. In order to overcome this, the town water on its way to the overhead tank was heated by means of the hot water used for warming the laboratory. The water was never turned off from the calorimeters, and a steady inlet temperature was thus obtained. Trouble was experienced from pockets of air in the warming system; but this was overcome by air-vents on every bend. Another condition was that the gas temperature must be steady. This was achieved by a mercury governor of the Stott type, followed by a balance governor of the Gas Referees' type (the only satisfactory type), and a small leather diaphragm governor at the meter-outlet to take up oscillations due to the meter. He went on to explain an actual test using the Junkers calorimeter, and said results within 1 p.ct. could always be obtained. The Junkers and Boys calorimeters gave figures which compared well. The Junkers, however, was much more suitable for everyday use, especially where a number of different gases were to be tested, and it was necessary to change over from one to another. Sometimes there was a slight discrepancy in values given by a Boys calorimeter after three months' working. The causes of error were not always obvious; but a small quantity of dilute hydrochloric acid through the water course would usually cure the trouble.

Regarding the checking of calorimeters, he observed that it was to be regretted that no method of checking was available in which a pure gas could be burned giving similar products to coal gas. Hydrogen could not be prepared sufficiently pure, and gave uncondensable products; while CO gave no condensable products. Electrical methods of checking were open to the same objection. Supplies of sufficiently pure CH were not available. Combustion of this gas would give products containing the requisite amounts of water vapour and CO_2. Comparison with a standard Junkers gave satisfactory results; but a comparison method necessarily took rather longer than a direct one. In addition to frequent tests on town's gas, they at Nechells carried out tests on continuously collected samples taken from the coal-gas stream at each works. Three samples per day were collected in 200 c.ft. holders, and such samples covered roughly the works shifts. The variations in pressure were cut out by means of Stott mercury governors; and the rate of collection was regulated by the number of pet-cocks opened in parallel at the outlet governor.

As to recording calorimeters, Sir George Beilby had, he said, pointed out that, if the proposed system of selling gas on a thermal basis is adopted, the establishment of a recording gas calorimeter as the standard instrument was of the first importance. Check calorific value tests were made several times a week; and in only one instance during several months was a correction of more than 10 B.Th.U. necessary. Their own experience, using a Beasley recorder, checked daily, and corrected for temperatures and barometer, showed that, on town gas, a correction of more than 5 B.Th.U. was rarely necessary. But to get this result, it was requisite to keep the temperature of the room constant, and not higher than 70° Fahr. Draughts and variations of pressure must be obviated. A special form of Beasley recorder used on the Mond gas plant at Saltley, with a range of 50 to 250 B.Th.U., was particularly satisfactory; and the working of the producers was largely based on its readings.

Mr. Gee then alluded to instruments used for gas analysis, with particular reference to a modified Orsat apparatus designed in the special laboratory of the Birmingham Gas Department, by Messrs. Rhead and Myhill. By means of this apparatus, it was possible to carry out an analysis for CO_2, unsaturated hydrocarbons, O_2, CO, H_2 and CH_4 (together), and N_2, in about forty minutes. The use of the CO_2 generator overcame the serious trouble of leaks which occurred in the "Davidson" form of nitrogen apparatus, involving the evacuation of the copper oxide tube by means of mercury reservoirs. Mr. Gee then discussed the various methods and apparatus for determining the specific gravity of gas, instruments required for the estimation of temperatures and thermo-electric thermometers. Regarding temperature estimations, he explained that the type of instrument to be used depended chiefly on the range of temperature and the positions at which the readings were to be taken. The efficiency of condensing plant, scrubber plant, and purifiers could largely be judged by their indications. On the station meters, a better type, consisting of a metal case, protecting a mercury-in-glass thermometer, the stem of which formed a spiral paralleled to the main, was frequently employed. On the benzol plant and the tar plants, special thermometers were required with a more open scale. Whatever type was used, it was advisable that the readings be checked against a checked thermometer, both before use and periodically during use. He regarded as the most accurate and reliable of the thermo-electric thermometers the platinum resistance thermometer.

DISCUSSION.

The PRESIDENT moved a vote of thanks to Mr. Gee for his contribution. The importance of checking instruments could not be overrated; and he thought the smaller undertakings might well enter into some arrangement for their apparatus to be checked generally.

Mr. T. H. POULSON (Stafford), who seconded, pointed out that the pressure in the various appliances must be constant.

The resolution was unanimously carried.

Dr. E. W. SMITH (Chief Chemist to the Birmingham Gas-Works) observed that if scientific instruments were properly used, much labour, which generally devolved upon juniors, though it might unnecessarily engage the attention of senior chemists, might be dispensed with. One of the most important points raised in the paper had relation to recording calorimeters. He understood from the Press that the Board of Trade were going to check the workings of gas undertakings by means of recording calorimeters, that the correct figures shown on their records would be averaged for 24 hours, and that the average figures so obtained must never be below the declared figure of the particular gas undertaking. It almost looked as if Sir George Beilby had satisfied himself that there was only one combination of instruments which would give the results he desired. It would be a pity if the condition of things that existed in London for calorific value testing were perpetuated in respect to the definite compulsion to use a particular form of apparatus (the Boys), for giving results desired by the official testers. If Sir George Beilby took only one firm's apparatus, however good it might be, the effect might easily be to check improvements that might otherwise be brought out by the particular firm or others. His view was that the limits should be specified within which the calorimeter should work, and its degree of accuracy. Then, subject to working within these limits, the authorities should allow any instrument which met with the approval of, and was accepted by, the Gas Referees. He did not want any such restriction applied to the recording instruments. He was satisfied that the Beasley instrument, worked in conjunction with the other apparatus specified by Sir George Beilby, would give more regular and satisfactory results than any other instrument known to him. Sir George had, it was true, not specified that there should be one instrument only; but the trend seemed to be in this direction. As to gas analysis, Messrs. Rhead and Myhill were to be congratulated upon bringing out a form of works apparatus which, after long trial, was proved entirely satisfactory for works purposes and equally satisfactory for much research work. It was satisfactory that the question of specific gravity had not been overlooked in the paper, because it was probably more important, from the consumer's point of view, to have a proper record of specific gravity than any other particular factor in connection with gas quality. There might come a time when gas consumers' associations would consider it necessary that this question of specific gravity should be more closely watched. As to instruments for measuring temperatures, it should be remembered that it was not advisable to use thermocouples when taking temperatures of combustion chambers, even when they were sufficiently low. They measured the temperature of the combusting gases. Optical and radiation pyrometers should be used in such cases.

Mr. T. F. E. RHEAD (Birmingham) strongly emphasized the need for checking working thermometers. In benzol recovery, work had to be done within very fine limits. Too much care could not be taken of recording instruments—they should be kept scrupulously clean.

Mr. MYHILL (Birmingham) commented upon the amount of leeway that had to be made up by the English makers of scientific instruments, some of which did not compare well with those made on the Continent. It was satisfactory, however, that advances were being made.

Mr. GEE returned thanks, and replied briefly on the discussion. He agreed with Mr. Poulson that trouble frequently arose owing to variations in pressure or temperature.

Mr. W. BATT (Birmingham) here took the chair, as Mr. Barber had another engagement.

POWER PLANT ON GAS-WORKS.

Mr. MILLS, in his paper, pointed out that the necessity for the most economical working of power plant of all descriptions was of almost paramount importance. Increasing fuel costs and supply difficulties, which had reached almost a climax during and since the war, were no doubt the cause of so much attention to the subject by the scientific societies, and the technical and even the popular Press. Accurate means of measurement, or scientific apparatus, was essential. With regard to the measurement of the boiler feed-water an ordinary Kent or Glenfield and Kennedy integrating meter was quite useful; but as a continuous record was advisable in addition to an integrator, a recorder might be used. Two notable types of instrument were based on the "V" notch and Venturi tube. The Lea Recorder Company, of Man-

chester, made an excellent "V" notch instrument, and George Kent, Ltd., of London, instruments of both types. The "V" notch was essentially an "open end" instrument, and the Venturi tube a pressure one.

The fuel and water supplied to boilers being properly measured, it was necessary, for a full statement of the efficiency of the boiler plant, to take continuous records of temperatures and steam pressures. For pressure records, any good form of pressure-gauge with clock-worked chart was quite good, if periodically, or as occasion required, adjusted. A test pressure-gauge, even of a portable type, was a necessity, if accuracy were desired. For the determination of the efficiency of the combustion of the fuel in the boiler, it was necessary, as in the case of a retort-setting or bench-producer, to determine at least the CO_2 in the waste gases. Its continuous analysis was desirable, some form of CO_2 recorder was advisable. The "Sarco" recorder and the "CO_2 Bustion" recorder were reliable, and gave little trouble.

Having thus obtained the primary measurements, the boiler plant results might be as systematically obtained, as in the carbonizing report. Further, if the conditions allowed, a system of payment on results in the boiler-house, or rather a bonus on results—was easily possible—*e.g.*, a normal day-work evaporation was ascertained (say 6 lbs. of water per 1 lb. of fuel). Then, for every additional (say) 0·1 lb. of water evaporated, a certain bonus was paid to all concerned. The CO_2 results were used as proportioning figures to obviate any shifts benefiting at the expense of others. The economy effected by this scheme was obvious.

The actual evaporation at the boilers having been determined, it was possible, Mr. Mills proceeded, by the use of steam-meters, to obtain accurate accounts of the use of the steam on the works. The efficiency of prime movers and apparatus might be checked, and also the cost dissected to (say) engine house, benzol, sulphate, and carburetted water-gas plants, and general use. Unaccounted-for steam, analogous to unaccounted-for gas, might be determined, and would incidentally be a proportionately much greater item. Steam-meters had always been viewed with suspicion by steam engineers; but they were now supplied with guarantees of accuracy within 2 p.ct. either way. The British Thomson-Houston instruments up to 2 in. size were provided with a throat orifice, and above 2 in. with a special form of nozzle plug inserted across the steam-pipe, and having a leading and trailing set of pressure holes. The instruments might be merely indicators, or might be fitted with chart and integrator. With the use of a steam turbine—for exhausting, boosting, and blowing machinery—some such meter, in the absence of condensing plant, was the only means to be employed for determining steam consumptions. With a reciprocating engine, however, the engine indicator was necessary in order to test efficiencies. The engine indicator was rather a district than a works instrument, as, of course, the faults of consumers' gas-engines were easily put down to the gas supplied; but on the works it was often useful for testing purposes. The general construction of most makes of indicator—which followed the lines of Watt's original invention—hardly needed mention; but it might be worth while to note that its results should not be expected within 5 p.ct. of accuracy.

In gas-engine work, a useful instrument for ascertaining the valve timings was the gradometer. Where electricity was in use on a works, in addition to the main wattmeter, which gave the total B. of T. units used, it was necessary, in order to be able to check units used for the various purposes, to have permanent secondary wattmeters on the various circuits—somewhat analogous to secondary gasholders—or, at any rate, a portable wattmeter for test purposes. Such meters had been to his knowledge a valuable check on consumption, and also on the state of repair of motor-driven plant. Another electrical instrument, which however had only been introduced during the war was the Thomas gas-meter. It was an American invention, and the working principle was the measurement of the amount of heat required to raise the temperature of the whole of the gas to be measured by a constant amount. The temperature rise was arranged to be constant; and the specific heat of the particular gas to be measured—say, producer, blue water, or coal gas—was constant within the accuracy of any meter.

DISCUSSION.

Dr. SMITH moved a vote of thanks to Mr. Mills for his interesting contribution. All were, he thought, agreed that the question of power production—steam raising and the efficiencies of steam raising—should receive more attention, particularly on gas-works. Mr. Mills had made a special study of the matter; and he hoped that he would be able to indicate to the Birmingham Corporation what the possibilities were of a technically trained man being in charge of large boiler installations. He was sure if he had the necessary equipment that he would prove the value of such an innovation in a gas-works.

Mr. RHEAD (Birmingham) said while it was useful to see various types of instruments employed, the question of the control of fuel put under the boilers was one demanding closer attention.

Mr. H. W. DEAN (Nechells) said it appeared to him likely that few of the smaller gas-works would be able to adopt many of the instruments referred to. As to the Thomas electrical meter, he thought good results might be obtained if it could be installed on the foul main from the retort-house.

Mr. J. W. WOOD (Leeds) said he had had some experience with water-meters. The general fault was that if a meter were run at much below its rate of capacity it failed to read correctly.

Mr. MILLS replied briefly on the discussion. Although he had no close personal knowledge of the working of the Thomas electrical meter, many were in use in America, and were reported satisfactory.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

South Metropolitan Gas Company and Coal Conservation.

SIR,—When the Government official, inspired doubtless by communication with the Company having the largest experience of the supply of poor gas, issued the ukase that the make of gas was to be "stretched" to produce a quality not exceeding 425 B.Th.U., he forgot to say how it could be complied with in the case of undertakings without water-gas or vertical retort plant, and who were already obtaining their maximum yield of thermal units from the coal.

Perhaps, Sir, from your Editorial Chair, you can supply the omission? I cannot.

Allow me to take the opportunity of writing to say, in reference to your strictures on Mr. M'Leod, that our practice with regard to the Press—technical as well as ordinary—is to accede to any request for an interview. In technical matters we are generally given the opportunity for a revise of copy; in the case of the Daily Press this is rarely possible. But in either case we tell the interviewer the whole truth to the best of our knowledge; and this practice we shall certainly continue to follow, however unpalatable it may be to those who have done so much to bring our industry into discredit.

A word in conclusion. I, like you, Sir, have to please my customers. And if gas free from naphthalene and bisulphide assists in this, I shall continue my efforts to provide them with it. The goal is a nearing one, though I claim only to see it, and not to have reached it.

CHARLES CARPENTER.

South Metropolitan Gas Company,
Old Kent Road, S.E., Nov. 22, 1919.

[We decline the invitation to give Dr. Carpenter information as to how he should carry on his carbonizing operations when Government instructions order a change. When the instructions were issued, we wrote in the "JOURNAL" for Sept. 30 [p. 727]: "How gas undertakings that depend solely on coal, and are not equipped with water-gas plants or steaming arrangements, are to slip down to 425 B.Th.U., without heavy dilution with inerts, is not clear. If, for instance, the South Metropolitan Gas Company attempt to comply with the Order, their gas will have seriously to depart from the 12 p ct. maximum of inerts to which they now work." But, so far as the results of official tests are available, there appears to have been no effort whatever on the part of the Company to do anything to show that they were anxious to comply as far as possible with the Government instructions. The London County Council tests from Sept. 29 to Oct. 18 (which dates include the greater part of the strike period) show an average of 558·7 B.Th.U.—the maximum return being 574·9 B.Th.U., and the minimum 500·1 B.Th.U. This shows anyway an ability to reach a "minimum" of 500 B.Th.U. The average, however, indicates that the tendency was always more towards the maximum than towards the minimum. The South Metropolitan Company is not the only one in the country using similar coal, and not possessing water-gas plant or the means for steaming. Mr. M'Leod told the "Daily Sketch" representative that during the strike period the "pre-war standard" had been "maintained;" and he apparently gloried in the fact—Government instructions notwithstanding. Dr. Carpenter is declaring the non-elasticity of his methods, and the impossibility of, under them, increasing to any material extent the production of B.Th.U. per ton of coal delivered on to his works.—ED. G.J.]

SIR,—Dr. Carpenter, in his letter in your last issue, says: "The answer to Yorks. is a very simple one." A simple answer will be acceptable. What we wish to know is the number of tons of coal saved by the South Metropolitan Gas Company. If the saving amounts to 15 p.ct. of the pre-war requirements per million cubic feet of gas manufactured, we shall be satisfied; if the saving is less than 15 p.ct., the South Metropolitan Gas Company has done less than its duty in time of difficulty and extreme scarcity, and our consumers (in Yorkshire) have suffered more than was necessary. Before the calorific standard was reduced by order of the Government, the standard of quality in Yorkshire was higher than that of the South Metropolitan Gas Company. Therefore our consumers have more cause to "strongly resent" the reduced standard than those of the South Metropolitan Gas Company.

YORKS.

Nov. 22, 1919.

SIR,—There is a sentence in Dr. Carpenter's letter in yesterday's "JOURNAL" which you did not mention in the editorial note that you appended to it. The sentence is: "We have been able to reduce our coal requirements relatively, and have been spared any need of the too frequently used substitute of 'stretching,' which consumers in South London would certainly strongly resent."

I should like to know what Dr. Carpenter means by "able to reduce our requirements relatively." Relative to what? The order was 425 B.Th.U. gas. How many B.Th.U. per ton of coal used would the South Metropolitan Company have obtained if they had worked down, as near as their conditions would allow, to the 425 B.Th.U. compared with the B.Th.U. per ton secured by making gas of an average of 558·7 B.Th.U.? I quite recognize there is not much elasticity in the South Metropolitan Company's manufacturing system.

The words, however, to which I take greater exception are: "Which consumers in South London would certainly strongly resent." In a

national emergency, it is not what the consumers in South London may think or resent; it is what is the right thing to do in the national interests. No large mind would rule otherwise. Concentration of B.Th.U. per cubic foot is not the only obsession of the dominant party in the administration of the South Metropolitan Company.

Nov. 19, 1919. BROAD OUTLOOK.

[Since the receipt of the letter signed "Broad Outlook," a gas consumer in South London writes to us on the same point. He says: "The gas consumers of South London do not, and have not desired, to sell their patriotism at the price of evasion by gas companies of instructions made in the national interests."—ED. G.J.]

The One-and-Twopence per Ton!

SIR,—So much has been written and said of late on the subject of the proposed limitation of coal owners' profits to 1s. 2d. per ton, that, were the suggested system not so complicated, it would be surprising how few people really know what it means. So many people imagine that 1s. 2d. profit is to be guaranteed on each ton raised, that they think the coal owner who was making only 6d. per ton before the war will do very well. The real scheme is very different.

It is proposed to limit the total profits to be allowed to the industry to the year's output at 1s. 2d. per ton. That is where the 1s. 2d. comes in. The estimated output for the year ending April 5, 1920, is taken at 225,000,000 tons. This quantity at 1s. 2d. gives a sum of £13,125,000 to be divided among the whole industry, as against the total pre-war profit of £25,000,000.

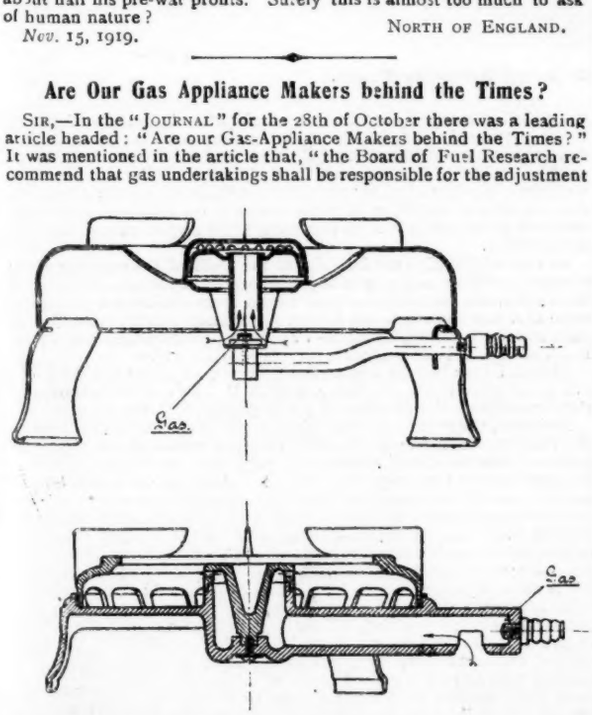
To find the proportion in which this sum is to be divided among individual producers, the pre-war profit per ton of each colliery is taken. The profit per ton to be allowed now is in proportion to the pre-war profit per ton as £13,125,000 is to £25,000,000. Thus, if 3s. per ton was made on the standard output before the war, the profit allowed now will be $\frac{3 \times 13{\cdot}125}{25}$ s., or 1s. 6·9d. per ton. This means a reduction of 47·5 per cent. in pre-war profits, if the owner has been able to maintain his pre-war output. If, owing to industrial or other causes which are beyond his control, his output has fallen below his pre-war standard, the already reduced profits are still further reduced in the same proportion as his output.

Where is the inducement under such a scheme to produce coal economically, as against increased production at any cost? With the increase in everything else except coal profits, where is the money to come from that used to be set aside for development work, so necessary to the prosperity of the industry and the whole country? Where is the inducement for the coal owner to obtain the best possible prices from neutrals, which at present constitute such a profitable source of revenue to the Exchequer and the coal control? Where, indeed, can the slightest justification be found for reducing coalowner's profits by almost one-half, when all other industries are allowed to retain the whole of their pre-war standard, and 60 p.ct. of any excess? But the Government will still, no doubt, go on the assumption that the owner will continue to "play the game," while labour sits smugly on the iniquitous minimum wage, produces what it chooses and no more, or strikes from time to time for still more fabulous wages; and that he will continue to "play the game," and, since he made no fuss when the coal industry was limited to a far greater extent as to profits during the war than any other, no doubt he will quietly see himself robbed of about half his pre-war profits. Surely this is almost too much to ask of human nature?

Nov. 15, 1919. NORTH OF ENGLAND.

Are Our Gas Appliance Makers behind the Times?

SIR,—In the "JOURNAL" for the 28th of October there was a leading article headed: "Are our Gas-Appliance Makers behind the Times?" It was mentioned in the article that, "the Board of Fuel Research recommend that gas undertakings shall be responsible for the adjustment



of appliances to meet the lower calorific grades of gas;" and it is emphasized that gas-consuming appliances must in future be constructed to so regulate the quantity of air that different kinds of gas with lower B.Th.U. can be used without difficulty.

I send you a little pamphlet, which is the result of experiments with gas-cooking apparatus executed at the request of the Ministry by Mr. E. Schou, Professor in Engineering, Mr. C. I. H. Madsen, Gas Chemist, and Mr. I. Irminger, Chief Engineer, together with three ladies (expert), who tested the gas-cooking apparatus for kitchen-use.

The experiments were directed to the purpose of examining twenty-nine different gas-cooking appliances sent from different firms, as to:

1. Their effective power.
2. Their faculty of using coal-gas, water-gas, wood-gas, and peat-gas.
3. Their faculty of burning with small consumption of gas.
4. Their practical use in the kitchen.

As to 1, it appeared that the best apparatus had an effective power of 67·4 p.ct., averaging 62 p.ct., and the least effective 50·1 p.ct.

As to 2: In this direction there was a great difference between the various appliances. But there were several of them (Nos. 1, 2, 3, 4, 5, 6, and 16) which were able to burn all kinds of gas with the same result, without any regulation of the air supply, and without back-firing. These appliances were tested with coal-gas, wood-gas, peat-gas, and coal-gas mixed with water-gas. All kinds of gas gave the same result.

Drawings of the apparatus are indicated in fig. 1 and fig. 3 on pp. 4 and 5 of the pamphlet. [These are reproduced.—ED. G.J.]

As to 3: It appeared that the best of the apparatus was able to regulate the flame so much that the consumption of gas was only one-sixth of the normal.

It is specially the experiments and apparatus mentioned under section 2, which have the greatest interest at the present time, when gas is of so variable a composition and lower B.Th.U. than the usual coal gas. The great advantages of these appliances is that no regulation of air is necessary. They are very much used in Copenhagen, and are manufactured here in our country.

I should be glad if these details are regarded as of interest in English affairs.

J. O. V. IRMINGER.

Eastern Gas Works, Copenhagen, Nov. 15, 1919.

Coke-Oven Gas at Sheffield.

SIR,—In your leaderette referring to my paper on the above subject, I note you question the 40,000 to 50,000 tons of coal per annum which I said the railways or streets, or both, were relieved of, and that you suggest 30,000 tons would be nearer the mark.

The difference between us is probably due to the fact that you base your figures upon the average to date of about 7¼ million cubic feet per week, whereas I based mine on the recent improved supply, which, in September, amounted to 9,292,000 c.ft.; in October, to 9,527,000 c.ft.; and in November (to date), to 9,905,000 c.ft. per week. I based upon 11,000,000 c ft. to the ton; the latter figure being at the rate of 46,800 tons per annum.

J. H. W. LAVERICK.

Tinsley Park Colliery Company, Ltd, near Sheffield, Nov. 19, 1919.

Coal Profits and the Government.

SIR,—As one who has had commercial interests in coal matters in the past, may I crave space for a few remarks upon the subject of the expressed intention of the Government to introduce a Bill to limit for the current year the profits in the coal trade to 1s. 2d. per ton. Against this contemplated limitation it is difficult to speak too strongly. Such interference with the liberties of private enterprise is full of menace to all British industries, and will constitute a most dangerous precedent. If once enforced in respect to the coal industry, no British industry will be secure from similar Government inroads.

This proposed interference with the coal trade profits is not only unjust in principle, but is also of no advantage whatever to those most concerned—the general public—in respect either to increasing the output of coal or to lowering the price. The injustice lies in the fact that the Government intention is to apply the limitation of profits to only one industry—the coal trade. Why this particular industry should be singled-out for this mischievous handicapping is best known to those who have advised the Government to take the step. As regards benefiting the public, no support for the projected restriction of profits can be found in this direction. The effect will be quite the reverse. A limitation of profits can only mean the plunging of a number of colliery concerns into financial trouble, which will lead to embarrassed working and doubtless in some cases to actual closure.

The Government seems to forget, too, that the coal industry is a "wasting" industry, and by its nature a somewhat speculative one. It is essentially an industry in which reserves of capital are particularly necessary, to provide against contingencies. Coal seams can be worked out; faults can appear, involving possibly great loss; floodings, explosions, and other disasters are not unknown; and to these, labour troubles may be added. Why, in the face of all these factors, the Government should plunge so essential an industry—the acknowledged "key of key" industries—into further difficulties, is a subject of astonishment to most people. One has to turn back to Stuart days—the days of "benevolences" and forced loans—to find a precedent for this latest Government attempted "snatch" at private earnings.

Collieries in this country are largely owned by shareholders scattered throughout the length and breadth of the land, and drawn from all classes, from the highest to the humblest thrifty small holder. These are the people who will suffer from this inroad on the coal industry; and if this is permitted in respect to the coal industry, other industries—the iron trade, shipbuilding, shipping, textile industries, and even trade papers—may be similarly harassed in the future.

It behoves, therefore, that all interested in the industrial welfare of the country should unite in protesting against this ill-advised intention of the Government.

W. H HARVEY.

77, *Montholme Road, Wandsworth, S.W.*
Nov. 19, 1919.

REGISTER OF PATENTS.

Making Combustible Gases from Carbonaceous Material.—No. 119,874.

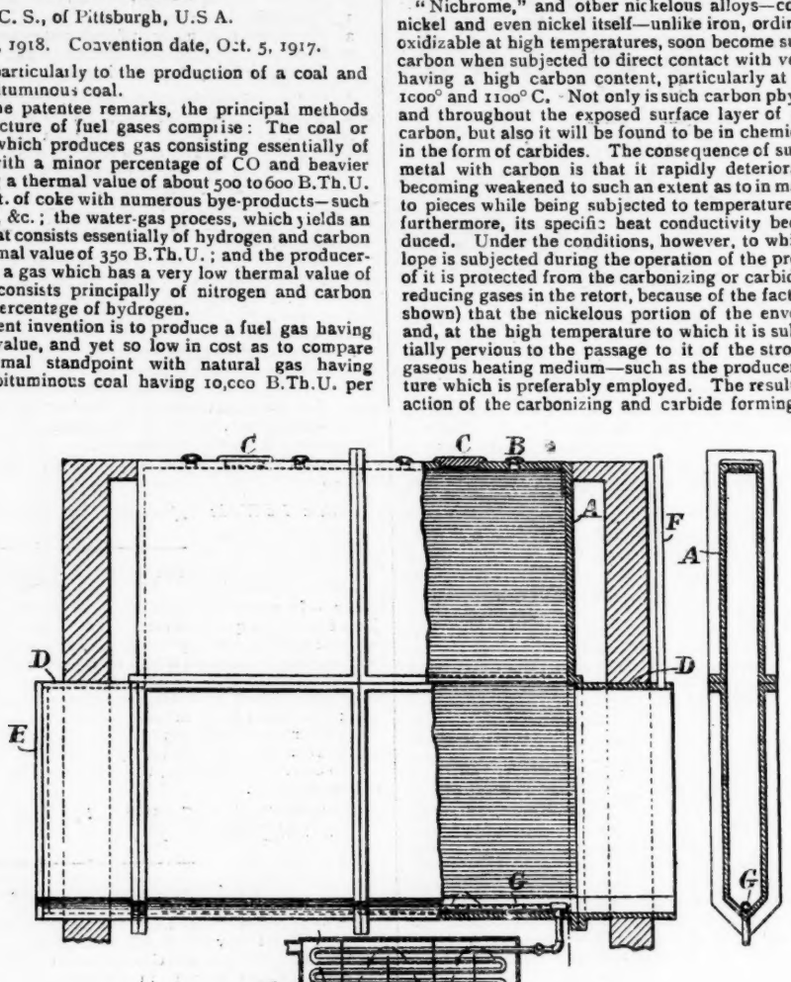
PALMER, C. S., of Pittsburgh, U.S.A.

No. 16,304; Oct. 7, 1918. Convention date, Oct. 5, 1917.

This invention relates particularly to the production of a coal and water gas mixture from bituminous coal.

At the present time, the patentee remarks, the principal methods employed in the manufacture of fuel gases comprise: The coal or illuminating gas method which produces gas consisting essentially of methane and hydrogen with a minor percentage of CO and heavier hydrocarbons, and having a thermal value of about 500 to 600 B.Th.U. and yielding about 65 p.ct. of coke with numerous bye-products—such as tar, ammonia, benzene, &c.; the water-gas process, which yields an uncarburetted product that consists essentially of hydrogen and carbon monoxide, and has a thermal value of 350 B.Th.U.; and the producer-gas process, which yields a gas which has a very low thermal value of only 150 B.Th.U., and consists principally of nitrogen and carbon monoxide with a minor percentage of hydrogen.

The object of the present invention is to produce a fuel gas having relatively high thermal value, and yet so low in cost as to compare favourably from a thermal standpoint with natural gas having 1000 B.Th.U. or with bituminous coal having 10,000 B.Th.U. per pound.



Palmer's Plant for Producing a Ceal-Gas and Water-Gas Mixture.

A longitudinal vertical section, and a transverse vertical section of the plant employed is shown.

The fire-brick walls of the heating chamber have the usual heating flues. A is a long, narrow chamber or retort, preferably about 20 ft. by 10 ft. and 8 in. to 10 in. wide, having a V-shaped bottom; the walls being about ½ in. thick. The heating chamber is provided with a gas inlet, through which it communicates with the usual checker-work of regenerators below (not shown). Preferably the retort is constructed of a highly refractory, non-oxidizable metal—such as nichrome steel, though nickel steel or nickel may be employed in lieu thereof. Poke holes B and charging holes C are provided at the top of the retort. The lower section preferably has cast-iron extensions D communicating with a discharge reservoir for the coke residue at the end, and having a cast-iron door E. A gas outlet conduit F communicates with the interior of the retort. In the apex of the bottom of the lower section is a longitudinal steam-pipe G, which has perforations at intervals along the top in order to uniformly admit steam into the bottom of the retort.

The operation of the process is as follows: Sufficient bituminous coal is introduced to substantially fill the entire retort. The coal is then coked at the usual temperature by means of heat conducted to it from the gases in flues through the highly conductive thin, metallic walls of the retort. The gas so generated is led away through the pipe F to store, and the coke is removed to another similar retort in order to subject it to the second stage of the process. But preferably the second stage is conducted in the same retort. The coal gas so obtained will be scrubbed and otherwise treated in the usual manner to obtain the bye-products, such as tar, ammonia, benzol, &c.

Owing to the high conductivity of the thin walls of the retort, which are preferably about ½ in. thick, and should not exceed 1½ in. in any event, "even the coking may be accomplished in a shorter space of time than the present process, and, as a consequence, there is but a minimum of fuel and time required for this stage of the process."

In order to produce water gas from the coke residuum of the first stage of the process, the retort is first sufficiently heated by the furnace gases passing through the flues so as to maintain the mass incandescent by indirect heat only throughout the second stage of the process—preferably about 1100° C. Steam is then introduced in sufficient quantities to convert the incandescent coke into water gas. Preferably the steam is superheated—superheating being decidedly more efficient. Owing to the high heat conductivity (as stated) of the thin metal walls of the retort, this second stage of the process is completed very rapidly as compared with the usual procedure; and the periodically injected hot blasts of atmospheric air are not required to maintain the requisite temperature for the production of water gas.

"Nichrome," and other nickelous alloys—consisting principally of nickel and even nickel itself—unlike iron, ordinarily, while difficultly oxidizable at high temperatures, soon become superficially loaded with carbon when subjected to direct contact with very hot reducing gases having a high carbon content, particularly at temperatures between 1000° and 1100° C. Not only is such carbon physically deposited upon and throughout the exposed surface layer of the metal as graphitic carbon, but also it will be found to be in chemical combination with it in the form of carbides. The consequence of such loading of nickelous metal with carbon is that it rapidly deteriorates structurally, often becoming weakened to such an extent as to in many cases even crumble to pieces while being subjected to temperatures up to 1100° C.; and, furthermore, its specific heat conductivity becomes very greatly reduced. Under the conditions, however, to which the nickelous envelope is subjected during the operation of the process, the inner portion of it is protected from the carbonizing or carbide-forming action of the reducing gases in the retort, because of the fact (as investigations have shown) that the nickelous portion of the envelope is extremely thin, and, at the high temperature to which it is subjected, is at least partially pervious to the passage to it of the strongly oxidizing external gaseous heating medium—such as the producer gas and hot air mixture which is preferably employed. The result is that the deleterious action of the carbonizing and carbide forming gas within the retort upon the inner exposed layer of the envelope is substantially, if not entirely, prevented; and, instead of the structure of the envelope being seriously weakened and the specific heat conductivity of the envelope greatly diminished (as would ordinarily be expected by those familiar with the behaviour of nickel and alloy consisting essentially of nickel), the envelope is found to be extraordinarily durable, and even after repeated operations it retains to a remarkable degree its specific heat conductivity.

In view of the high conductivity of the walls of the retort and the elimination of the necessity of injecting a blast of heated air into it as mentioned, the patentee claims to obtain from the coke a maximum yield of a water gas mixture having a minimum amount of CO_2 and substantially free from nitrogen—*i e*, about 5 p.ct. and less than 1 p.ct. in all cases where the process is properly carried out.

The coal gas obtained has a calorific value of about 600 B.Th.U., and water-gas mixture of about 400 B.Th.U. By a suitable mixing of the two gases a calorific value of 400 to 500 B.Th.U. can be obtained.

As stated, the *crux* of the invention resides in the indirect heating of the reacting mass due to the fact that the non-oxidizable, highly-resistant, thin metal wall promotes a quick and ready transfer of the large amount of heat required from the outside to the inside of the retort in which the water-gas reaction is proceeding; whereas, were the walls constructed relatively thick—say, in excess of 1½ in., even though they were of metal—the transfer of the necessary heat to accomplish the quick conversion of the coke or hard coal into water gas could not be accomplished, and prolonged heating of the coke by the periodic injection into it of hot blasts of air would be necessary in order to prevent the temperature falling below the point at which the water-gas reaction proceeds efficiently, because the reaction which occurs at lower temperatures must be avoided in order to obtain an efficient and satisfactory substitute for natural gas. Furthermore, the residual coke from the second stage of the process (containing, however, much residual good material) may be discharged, through partly housed and closed ways and crushing rolls [not shown], to a producer gas plant, which consumes the residual coke, producing much producer gas of low thermal value but which is adapted in suitable combination with heated air, economizers, and regenerators to heat the coal and water gas retorts in the first two stages of the process.

As is apparent from the foregoing description, the employment of a highly resistant, non-oxidizable metal retort, having walls not exceeding 1½ in. thick, has the following advantages over the present coal gas, water gas, and producer gas processes as commercially practised:

First.—It avoids the necessity for quenching the coke produced in the usual coal-gas process, after the removal of the coke from the coke-oven and prior to its introduction into the water-gas or producer-gas retort, and thereby substantially all of the heat retained in the coke at the end of the coal-gas stage is conserved, As above stated, the water-gas process is preferably conducted in the same retort as the coal-gas process immediately following the completion of the latter.

Second.—It avoids the necessity for the use of an intermittent air-blast to maintain the reacting temperature; and it thereby prevents the dilution of the gas with large amounts of nitrogen from the heated air-blast. Also the maintenance of the uniform temperature enables a much more economical and increased yield of gas of a more uniform composition to be obtained.

Third.—The employment of non-oxidizable, highly resistant metallic walls as a substitute for cast iron or other oxidizable metal retorts or the clay or silica retorts now used, permits of the reaction being completed in a much shorter period of time, because of the coal-gas reaction being conducted in but a fraction of the time required when the retorts now used, which heat extremely slowly, are employed.

Fourth.—One of the advantages of employing high-pressure superheated steam at a temperature of 750° to 1100° C. is believed to be due to the formation of increased amounts of higher hydrocarbons due to the increased dissociation of the steam, since it is well known that the addition of one or more atoms of carbon or hydrogen to a hydrocarbon in many cases very substantialiy increases its thermal value. This is shown by the following table, in which is given the relative thermal units per cubic foot of different hydrocarbons:

	Calories per Kg.		B.Th.U. per C.Ft.
C_2H_2	11,917	..	1,554
C_6H_6	10,102	..	3.954
CO	2,436	..	342
C_3H_6	12,420	..	1,870
C_2H_4	11,931	..	1,677
H_2	34,180	..	344
CH_4	13,320	..	1,070

In some cases, depending upon the character of the coal and the by-products desired, a small amount of superheated steam can be advantageously injected into the charge in the first or coal-gas stage of the process.

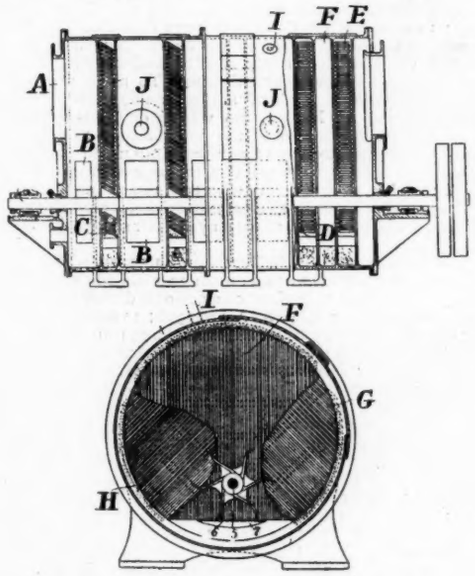
The expression "a metal associated with iron in the 'iron group' in Mendelejeff's table and of greater atomic weight than iron," refers to metals which are associated with iron in the group commonly known as the "iron group," consisting of iron (atomic weight 55·84), nickel (atomic weight 58·65), and cobalt (atomic weight 58·97).

Gas-Washer.—No. 133,987.

SIMON-CARVES, LTD., and BROWN, J. H., of Manchester.

No. 15 208; Sept. 19, 1918.

In their specification, the patentees remark: "It has been proposed to wash gases by subjecting them to the action of liquid sprays, and in such cases baffle-plates or equivalents have been used for removing residual moisture. It has been proposed to employ a succession of diaphragms or groups of parallel slats for treating gases. It has also been proposed to pass gases horizontally between drums, or sets of concentric drums, rotating in water, to expose the gas to their wetted surfaces and between eliminators or sets of louvred members." But their



Brown's (Simon-Carves, Ltd.) Gas-Washer.

invention consists in passing the gas in a horizontal direction alternately (*a*) through spaces having positive means for the production of spray, and (*b*) through latticed or louvred assemblages kept wet by liquid spray, preferably produced by paddles splashing-up liquid in the form of coarse spray.

The washer (as shown) comprises a cylindrical casing arranged with its axis horizontal. The gas enters at one end through a port A and leaves at the other end, traversing a plurality of sets of wetted surfaces in the form of wood slats inclined at an angle of (say) 30° to the axis and arranged so as to form a slotted diaphragm parallel with the ends of the casing. A shaft extends longitudinally through the casing below the axis; and on it are arranged paddles or blades B to splash-up, in the form of spray, the liquid which is contained in the bottom of the casing. Weirs C control the flow of liquid from one section to the next.

A spray catcher is provided at the end of the chamber, consisting (in the longitudinal elevation) of two sets of parallel horizontal slats D, E, and a set of parallel vertical slats F; and in the cross section of a set of vertical slats F and two sets of slats G H, whose longitudinal edges are oblique with respect to the vertical slats.

In operation, the gas passes longitudinally through the casing and meets the spray in the first section—carrying it with it through the downwardly extending spaces between the slats. The paddles cause the gas to traverse a somewhat spiral course; and the gas is alternately subjected to a rotary or spiral movement in contact with spray and a movement through scrubbing interstices between the wetted slats. A crude oil or water inlet I is provided on the casing, as also sight-holes J.

The gas travels downwards through the slats, and carries liquor with it; but the main circulation of liquor is in the opposite direction (from right to left), so that the liquor becomes more and more concentrated in its passage through the washer.

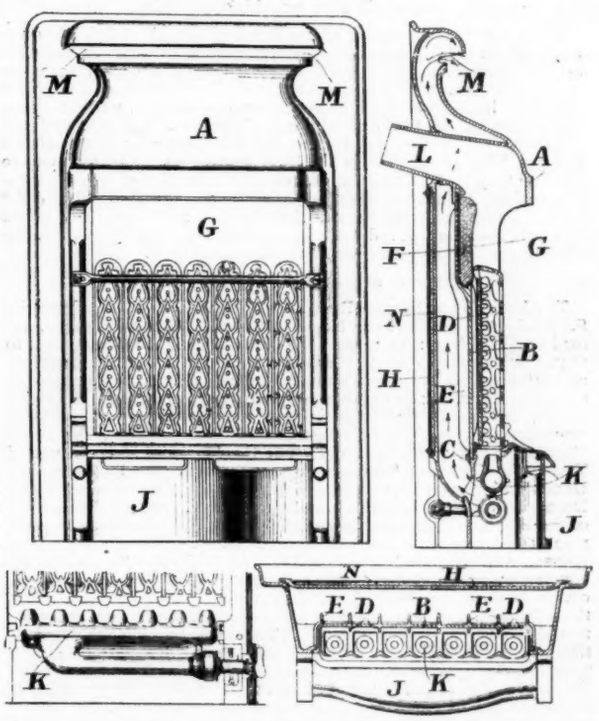
Gas Stoves and Fires.—No. 134,059.

LEWIS, G. M., MARSH, R. G., and ROGERS, R. J., of Edgbaston, Birmingham.

No. 18,302; Nov. 8, 1918.

The object of this invention is to adapt to, and combine with, modern types of gas-fires an arrangement for heating the air; so that convected heat, in addition to radiant heat, is given out.

In one form of stove the metal back plate is provided with ribs, fins, or projections (of any approved form) on the front toward the radiants, and at the back toward the air-chamber. On the back continuous vertical ribs are preferred to enhance the heating effect without interposing any obstruction to the air currents. Above the radiants, a fire-brick or like refractory apron is provided; and the air-chamber is continued up behind the apron and around the outlet pipe for the products of combustion into the canopy and out through conveying openings in the front.



Lewis, Marsh, and Rogers' Gas-Stove Fire.

The illustrations show a front elevation of the fire, a view of the lower part with the fender removed, a central vertical sectional view, and a cross sectional view with the fuel radiants removed.

Below the canopy A, instead of the usual fire-brick backing, is a cast-iron plate B, which rests on a rib C just below the level of the burner orifices. The plate B is ribbed, front and back, at D and E, and at a level just below the top of the usual vertical radiants it is cranked or set rearwardly, as at F, and then continued straight to the top. This cranking forms a supporting ledge for a fire-brick apron G between the ledge and the top of the plate which terminates under the hood.

The back plate is the full width of the fire, and an air space is left the full width between the plate and the back H of the complete fitting. The air inlet to this air space is through holes or slots in the rib C; and to the space below the rib the air is drawn through holes or slots in the

upper part of the fender J in front of the burner K, so that the air inlets are clear of the floor and free from dust.

The chamber continues on each side of the gas outlet flue L from the canopy and opens above the flue so that the heated air may pass out through openings M in the upper part of the hood.

This construction is said to form "a convenient and effective one, enabling considerable convected heat to be utilized for heating purposes. Further, the air passing up through the chamber is kept free from the burnt gases and dust, and thus pure warmed atmospheric air is supplied into the room."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bill.

The Ammanford Gas Bill was read the third time, and received the Royal Assent.

HOUSE OF COMMONS.

Coal Supplies to Gas Undertakings.

Viscount DUNCANNON asked the President of the Board of Trade whether his attention had been drawn to the fact that, owing to the Orders of the Board, gas companies and others who had previously drawn their supplies, or part of their supplies, of coal from Yorkshire by rail, were now compelled to take the whole of their supplies from Northumberland or Durham by sea, at a very heavy additional cost for transport; that in the case of the Dover Gas Company, who had during the war, at considerable expense, provided a railway siding at their works in order to reduce the cost, the additional cost of transport and handling coal of quality inferior for gas making had amounted to from 16s. to 18s. a ton, the rates of sea freight and demurrage fixed by the authorities being nearly five times the pre-war rates.

Sir A. GEDDES said his attention had been called to the matter, but he feared that, owing to the shortage of coal in Yorkshire and the Midlands, it was necessary to continue to supply Durham gas coal by sea as largely as possible to any gas-works that were capable of receiving it. He understood that, in the case of the Dover Gas Company, the action which was taken affected less than 10 p.ct. of the total supplies received by the Company.

Household Fuel and Lighting Order.

Sir A. GEDDES (President of the Board of Trade), replying to questions by Mr. Hopkins, said that the total number of local fuel overseers appointed under the Household Fuel and Lighting Order, 1919, was 1965. He was unable to say the amount of their salaries, as these officers and their clerks were appointed by the local authorities, who paid them and recovered part of the cost from the Treasury. The estimated contribution from the Treasury for this year was £400,000; but no claims had yet been received from the local authorities. The total cost to the Treasury of the administration of the Order for the current year—*i.e.*, to Dec. 31 next—was estimated as £449,200, which included the £400,000 previously mentioned. In respect of next year, there would be a very considerable reduction in expenditure. The question of the abolition of the fuel controllers was being dealt with.

Imports and Exports Regulation Bill.

The Imports and Exports Regulation Bill, which was introduced by Sir Auckland Geddes in the House of Commons last Wednesday, has for its main objects: To constitute a Trade Regulation Committee; to regulate the importation of goods with a view to preventing dumping, and safeguarding key industries and industries affected by depreciation of foreign currency; to regulate temporarily the exportation of certain goods; and to authorize the granting of credits and the undertaking of insurances for the purpose of re-establishing overseas trade. The Trade Regulation Committee is to consist of the President of the Board of Trade, the Financial Secretary to the Treasury, the Parliamentary Under-Secretary for Foreign Affairs, the Secretary of the Overseas Trade Department (Development and Intelligence), the Permanent Secretaries of the Board of Trade, the Comptroller of the Overseas Trade Department, and ten members of the House of Commons, nominated by the House. Orders made by the Board of Trade under the Act prohibiting importation or exportation, or for other purposes, will, in the ordinary course, have to be submitted to and approved by the Committee. For the safeguarding of key industries and industries affected by depreciation of foreign currency, the Board of Trade may prohibit the importation of goods specified in Part I. of the schedule; at any time within a period of three years from the termination of the war they may prohibit the importation of goods specified in Part II.; and on being satisfied that there has been such a depreciation in the sterling value of the currency of any foreign country as, not being adequately compensated by increased cost of production in that country, is causing or is likely to cause sales in the United Kingdom of the products or manufactures of that country to take place in substantial quantities at prices substantially below those at which similar articles manufactured in the United Kingdom can be sold, and that action under this provision is otherwise desirable, they may prohibit the importation of any class or description of goods manufactured or produced in that country. The goods in Part I. of the schedule include derivatives of coal tar generally known as intermediate products, capable of being used for dye-stuffs; and scientific and illuminating glass ware, Part II. comprises thorium nitrate, gas-mantles, and gas-mantle rings.

Coal Industry Bill.

Sir A. GEDDES, replying to a question by Captain W. Benn, addressed to the Prime Minister, said he could not at present state when the Government would be ready to introduce a Bill embodying their scheme for the organization of the coal industry.

NOTICES GIVEN FOR BILLS (SESSION 1920) RELATING TO GAS SUPPLY.

The undermentioned are the notices of which publication had up to last Friday been made of intention to promote Bills in connection with gas undertakings in the next parliamentary session.

Brighton and Hove Gas Company.—Application is to be made by the Brighton and Hove General Gas Company for further capital powers; for the removal of any limit on the rate of dividend which may be attached to preference capital of the Company that may hereafter be issued; for an increase of the standard price of gas, and (if thought fit) a variation of the sliding-scale of dividends; for the inclusion of provisions of any General Act which may be passed relating to the basis of charge for gas; for the inauguration of a profit-sharing scheme; for the holding of yearly, instead of half-yearly, meetings; for an increase of prepayment meter charges; and for regulating the supply of gas.

Commercial Gas Company.—It is the intention of the Company to apply for leave to introduce a Bill to alter the existing provisions in regard to the quality of gas; to abolish the prescribed illuminating power; and to make new provisions as to the quality of the gas and its calorific value, and as to the means and method and place of testing gas and the pressure of the gas to be supplied, and as to the basis of charge for gas. The Bill will also seek to alter existing provisions with respect to the sliding-scale of price and dividend and the standard price and the standard rate of dividend, and make new or substituted provisions in lieu thereof, and in particular to increase the standard price fixed by the Company's Act of 1902. There will be provision for the application to the Company, with or without modification or amendment, all or some of the provisions of any General Act which may be passed either in the present or in the ensuing session of Parliament dealing with the basis on which gas shall or may be supplied, or with the basis of charges for gas. The qualification of auditors of the Company and their duties and remuneration will be dealt with in the Bill.

Great Northern Railway Company.—One of the objects set forth in the long notice of a Bill by the Company is: To empower the Company to convey or transmit to and use on any portion of their railway or property gas, water, or electrical energy supplied to them by any gas, water, or electrical undertakers, whether the place of such user be within or beyond the limits of supply of the undertakers furnishing the supply, and to lay down, place, and construct upon any part of their undertaking mains, pipes, cables, wires, works, plant, and apparatus for, or in connection with, such conveyance or transmission, and to confer all such powers as may be deemed necessary or expedient upon the Company to take, and upon such undertakers as aforesaid to supply, gas, water, or electrical energy for the purpose of such use.

Masham Urban District Council.—A Bill is to be promoted for the transfer of the undertaking of the Masham Gas Company, Ltd., to the Masham District Council. The Council seek power to manufacture, store, and supply gas; to take gas in bulk from any corporation, company, or person; and to borrow money.

Redcar Urban District Council.—Authority is to be sought by the Council to acquire the undertaking of the Redcar, Coatham, Marske, and Saltburn Gas Company; for the employment of, or compensation to, the officers and servants of the Company, and compensation to the Directors; and for carrying into effect any agreement entered into between the Company and the Council before the passing of the Bill. The Council seek power to carry on the undertaking, and to be exempt from obligation to supply gas except as mentioned in the intended Act when the capacity of the mains is insufficient. The Bill is to define and fix the price of gas, and provide for differential charges; to authorize the Council to carry into effect contracts and agreements with respect to the supply by the Council of gas within or beyond the limits of supply, and to confer upon the Council special powers with reference thereto. To make provision with reference to the sale to any local authority whose district is beyond the urban district of Redcar, but wholly or partially within the limits of supply, of portions of the undertaking; to empower the Council to make or buy gas of any description; to prescribe such limitations and conditions in relation to the gas as may be deemed expedient; and to permit them to borrow the necessary money, to invest their sinking funds in statutory securities, including the securities of local authorities. and to use any of their sinking funds instead of borrowing.

Rochester, Chatham, and Gillingham Gas Company.—The Company intend to promote a Bill to enable them to raise further capital; to create and issue either as preference stock or ordinary stock all or any ordinary stock authorized by the Act of 1906; to define the minimum amount of stock that may be issued or held; to provide that preference stock shall not be taken into account in ascertaining the qualification of a director; and to authorize differential prices according to the purposes for which gas is supplied. The Company desire to acquire more land; to hold meetings annually, instead of half yearly; to have defined their obligations in regard to the supply of gas for purposes other than lighting; and to have power to prescribe and enforce specifications for consumers' pipes and fittings, and to make provisions as to the placing of meters. The Bill is also to empower the Directors to fix or alter the remuneration of the Secretary and Auditors; and to authorize the Company to make superannuation and other allowances, and to acquire patent rights or licences.

Salford Corporation.—In an Omnibus Bill to be promoted by the Corporation, there will be clauses regulating the sale of coke. Where coke, sold by weight in loads exceeding 2 cwt., is delivered by a vehicle, the seller shall deliver to the purchaser before the load is discharged a note in the form set out in the third schedule to the Weights and Measures Act, 1889, or to like effect. The purchaser or appropriate officials may require the weighing or reweighing of any coke so sold. Persons selling coke in a quantity exceeding 14 lbs. but not exceeding 2 cwt., will be required to sell or expose for sale such coke in sacks with a metal label indicating the correct legal weight or measure of the coke therein. Purchasers or officials

may require the weighing or measuring of such coke. Anyone offering coke from a vehicle in quantities not exceeding 2 cwt. shall have the name and address of the seller conspicuously painted on such vehicle. For neglect to carry out these provisions, false statements, or obstruction, penalties will be set out—as well as for wilfully increasing the weight of coke by damping.

Sheffield Corporation.—One of the main objects of a Bill which the Sheffield Corporation are promoting is to secure the transfer to them of the undertaking of the Sheffield Gas Company. The Corporation will seek authority to acquire the gas undertaking compulsorily or by agreement; to make provision with reference to all or any of the officers or servants of the Company and their transfer to the service of the Corporation, and the payment of compensation or bonuses in such cases as may be agreed or as the Act may prescribe; to supply gas to the city; and to purchase coke-oven gas and gas in a crude or unpurified form. The Bill is to define and fix the price of gas; to make such provisions as may be thought expedient with reference to the quality, illuminating power, and calorific value of the gas and the pressure at which it is to be supplied; and to enable the Corporation to supply or take gas in bulk.

South Metropolitan Gas Company.—Objects of a Bill which the Company intend to promote include: To regulate the borrowing powers of the Company, to authorize them to vary the mode of raising capital, and to provide for the issue of ordinary, preference, or debenture stock. To substitute for the existing provisions for the sale of gas by cubic measurement a method of charging based on the thermal units in the gas supplied; to enable or require the Company to declare from time to time the calorific value of the gas they intend to supply, to give notice to consumers or their representatives of any intended change in calorific value so declared, and to adjust and, if need be, to exchange without charge consumers' burners for others appropriate to the efficient use of the gas it is intended to supply; and to prescribe a standard of purity and pressure for, and a limit of percentage of inert constituents in, the gas to be supplied by the Company. To prescribe a standard or basic price for gas per unit of 100,000 B.Th.U., and to provide for the variation of such standard price; to prescribe a standard or basic rate of dividend on the ordinary capital of the Company; to provide for the application of profits in excess of such rates or such part thereof as the intended Act may prescribe; to reduce the price of gas to consumers to an increment of dividend to stockholders and to payment of co-partnership bonus to employees; to provide (and that in connection with, or irrespective of, any variation of the method or basis of supply of gas) for an alteration of the standard price and standard rate and sliding-scale of dividends applicable to the Company and for arriving at dividends payable by new methods; for fixing or calculating any such price, rate, or scale on a new basis; and if thought fit to provide for the determination or the variation of the standard price in relation to the purity or the degree of purity of the gas supplied. To amend the existing provisions relating to the charge for hire of prepayment meters and fittings, and to substitute provisions based on the quantity of heat units supplied through such meters. To make new provisions for testing and pressure of supply. To empower the Directors to establish a special purposes fund for the purpose of meeting expenses incurred in replacement or removal of plant or works, and to make further provision as to the reserve fund or other funds. To enable the Company to hold yearly meetings. To permit the Company to supply gas in bulk or in specially large quantities within or beyond their limits of supply and to public and local authorities and others, and to make and carry out agreements for such purposes. To empower the Company to purchase by agreement, take on lease, or otherwise acquire and hold further lands and buildings. To amend the provisions of the City of London Gas Act, 1868, and in particular sections 18 to 24 relating to the amalgamation of gas companies and section 64 of the Act of 1876, and to extend these provisions and apply the same, with or without modification, to any company or persons others than those mentioned therein who may be owners of an undertaking for the supply of gas in the limits of supply which adjoin, or are contiguous to, those of the Company, and to enable the Company and any such company, persons, or owners to amalgamate their undertakings, or to enable the Company to acquire the undertaking of any such company, persons, or owners, and to make provision with reference to such amalgamation or purchase, and as to the regulations of any such purchased or amalgamated undertaking, and as to the Acts and provisions to apply thereto, or to provide for the approval or confirmation of any scheme of amalgamation or purchase by the Board of Trade or other Government Department or authority, and as to the procedure of such Department or authority with reference thereto.

South Suburban Gas Company.—Notice is given by the Company of their intention to apply to Parliament for leave to introduce a Bill to empower them to use specified land at Erith for gas-works purposes; to raise further ordinary and preference capital; and to authorize the issue as redeemable shares or stock of any of the new preference shares or stock or debenture stock. The Bill is also to alter, or provide for the alteration, of the basis or method of charging for gas, and to provide that, as from such date as may be specified in the Bill, the price to be charged by the Company to persons who consume the same by meter shall be based upon the total number of units of heating power contained, or to be assumed to be contained, in the gas supplied, instead of upon the quantity or volume of gas supplied; and to provide that, as respects those parts of their area of supply within which the Company are under any obligation to supply gas of a prescribed illuminating power, they shall be relieved from this obligation, and a standard of calorific power be substituted. The Bill will, if thought fit, vary the standard of calorific power now applicable to part of the area of supply; and empower the Company from time to time, upon giving such notice as may be required by the Bill, to vary the standard or standards of calorific power for the time being applicable. It is to authorize the Company to supply for all or any of the purposes of their undertaking gas, or a mixture of gases, of any composition, provided that it complies with the standard of calorific power and of purity for the time being in force relating to the Company, and does not contain more than a specified proportion of inert constituents; to make provision as to the meters and other apparatus (if any) to be used for measuring the number of units of heating power supplied, and to make provision, if deemed expedient as to the mode of ascertaining from the records of such meters and apparatus the number of such units; to make new or substituted provisions with regard to the sliding-scale of price or dividends, with the object of increasing the rate of dividend on the ordinary stock in relation to the price being charged for gas; to prescribe the standard price for a specified number of heating units, and the standard rate of dividend on the ordinary stock; and it may provide a minimum rate of dividend on the ordinary stock. The Bill will make any modification necessitated by the new standard price in the rate of bonus payable under the co-partnership arrangements between the Company and their various employees.

Wandsworth, Wimbledon, and Epsom District Gas Company.—Notice is given by the Company of a Bill to empower them to stop-up and discontinue certain rights-of-way; to raise further capital, and, if thought fit, to attach to such new shares and stock, or any class or classes thereof, such rate or rates of dividend or interest, and such priorities, rights, privileges, or advantages, as may be found desirable or as the intended Act may prescribe; to increase the standard prices of the gas supplied by the Company, and, if thought fit, to vary the sliding-scale of dividends applying to them; and to apply to the Company, with or without modification, all or some of the provisions of any General Act which may be passed either in the present or in the ensuing session of Parliament making provision as to the basis on which gas shall or may be supplied, or as to the basis of charges for gas. Other sections of the Bill will provide for the holding of the ordinary meetings of the Company annually, instead of half yearly; for notice being given of a proposal to nominate a new, or oppose the re-election of a retiring, director, and for enabling the Directors to hold offices and hold and acquire interests in contracts with the Company under such conditions as may be prescribed; for fixing by the Directors the salary of the Secretary; for the issue of stock under a co-partnership scheme; and for the payment of superannuation and other allowances.

PROVISIONAL ORDER APPLICATIONS.

Braintree and Bocking Gas Company, Ltd.—An application is to be made to the Board of Trade for a Provisional Order by the Company scheduling additional land for gas-works purposes; for providing for the raising of additional preference or ordinary capital; the substitution of a calorific value test, instead of an illuminating power one; for regulating the supply of gas; for the creation of a special purposes fund; and permitting the supply of gas in bulk, within or beyond the Company's limits of supply.

Edinburgh Corporation.—Application is to be made to the Secretary for Scotland by the Corporation of Edinburgh for a Provisional Order to extend the boundaries of the city; to provide for the dissolution of the Town Council of Leith and the Town Council of Musselburgh or either of them; to dissolve the Edinburgh and Leith Gas Commission, and transfer the undertaking to the Corporation; to make provision as to the superannuation funds of the Corporation and the Gas Commissioners; and to extend the limits of gas supply so as to include the added area or part thereof.

Taunton Gas Light and Coke Company.—The Board of Trade will be applied to by the Company for a Provisional Order to enable them to raise additional preference or ordinary capital; to form reserve and special purposes funds; to establish a co-partnership scheme, and a benefit fund for employees; to acquire additional land for the purposes of the undertaking; to make further provisions with regard to the supply of gas and apparatus; to supply or purchase gas in bulk outside the Company's limits; and to purchase from other gas undertakings and persons residual products arising in the manufacture of gas and other materials, and to work up and convert these residual products.

Plymouth Gas Supply.

In response to a complaint of the quality of the gas supplied by the Company, Mr. G. H. Bolton (Secretary of the Plymouth Gas Company), has written to the local Fuel Overseer, explaining the difficulties under which the Company at present labour in maintaining supplies. He points out that in July last the Coal Controller issued instructions that no more coal was to be supplied to them by rail, and that all their requirements were to be obtained by sea. The Company immediately endeavoured to obtain the necessary tonnage; but owing to the shortage of shipping—for which the high freight ruling for traffic to Continental ports is largely responsible—they have experienced the utmost difficulty in obtaining supplies. The trouble was accentuated by a strike in September of men engaged in discharging a cargo of coal for the Company; and the result of all the difficulties is that the stock of coal at the gas-works is at a lower level than it has ever reached. Not only is the stock low, but certain of the consignments received recently have contained an abnormal quantity of dirt—some of the stuff that was invoiced as "coal" being absolutely useless for the purpose of gas manufacture. The result of these adverse influences is that it is impossible to maintain an adequate pressure in the mains, which is the real foundation of the complaints, and not the so-called bad gas. The Company's troubles are increased through the ironmoulders' strike, in consequence of which it is impossible to obtain materials necessary to enable them to utilise the manufacturing plant to anything like its full capacity. "It is so obviously against the interests of this Company that consumers should be dissatisfied," says Mr. Bolton in conclusion, "that I need hardly add we shall do our utmost to satisfy them during the trying period that is undoubtedly ahead of us."

Ballybay Gas Undertaking.—The Directors of the Ballybay (co. Monaghan) Gas Company have offered to sell their premises and plant to the Urban Council for a stated sum; and the matter is to be considered by a special meeting of the Council.

MISCELLANEOUS NEWS.

ORIENTAL GAS COMPANY, LTD.

The Ordinary General Meeting of the Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street, E.C., Mr. H. D. ELLIS (the Chairman) presiding.

The SECRETARY (Mr. S. Rainer) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read. The certificate of the Auditors was read.

THE ENTRANCE TO PEACE CONDITIONS.

The CHAIRMAN, in moving the adoption of the report and the statement of accounts, said the proprietors met last November, after five years of the horrors of war, then just arrested by an agreed armistice, full of hope and expectation that great things were going to happen, and that there would be relief from a great many of their tribulations. They now met again, still in the same condition of armistice. The country was not at war, and it was not at peace—still in a state of suspended hostilities only, in regard to most of the Powers with whom it was at war. How far distant peace might yet be, they knew not. This unhappy protraction of conditions of uncertainty was very prejudicial to trade and commerce; and they had felt it. There had been some improvements in the Company's surroundings and conditions—for instance, there had been no Government embargo placed upon the supply of coal in Calcutta, nor had there been any enforced reduction in the public lighting, as they had in the previous financial year. Also there had been acceleration of mail communication between this country and India. They had, however, been subject to harassing restrictions imposed on the export of apparatus hence, and to delays and difficulties in the transport of material to Calcutta which had not yet been fully surmounted. He would not dwell further on these drawbacks, but would pass to the more pleasant contemplation of the accounts—only pausing to remark that, in the opinion of the Board, they reflected the highest credit upon the General Manager, who, undaunted by difficulties, had carried on the business with a degree of success which was illustrated by the figures in the accounts. To him and to the excellent staff who had loyally aided him with their best exertions, the proprietors would presently be invited to send an expression of their warm recognition. He (the Chairman) was pleased also to inform the proprietors that Mr. Snelgrove was able this summer to take his home leave, long delayed by the action of the Government in commandeering for Government service all passenger accommodation in vessels leaving India for this country. The Directors had thus had the great advantage of personal discussion with Mr. Snelgrove about matters of the highest importance to the Company.

EXTENDING USE OF GAS.

Proceeding to the accounts, it would be seen from the revenue account that the gas rental amounted to £63,239. This was a considerable advance upon the corresponding figure of last year. He was happy to say the increase was derived from the private consumers. Business with the private consumers was extending; and he was sure the proprietors would agree with him when he said that a sound and well-secured business was best based on the supply of the necessities of the many rather than on the luxuries of the few. So they did their utmost to get as many consumers in Calcutta as they could; and they were succeeding very well. With regard to this he might say that the extension of the demand for gas for purposes of heating and power was extraordinary and most gratifying—such as was never dreamt of in the days when he first became a Director of the Company. In fact, they never thought then they would sell gas for heating and power purposes in India. Such business was, as be believed they all knew, a very great advantage in this way, that it tended to make an equilibrium between the night gas for illumination and the day gas for heating and power purposes; and thereby contributed economies in respect of storage. He wondered sometimes what might be lying in store for the gas industry behind the curtain of the future. Discoveries succeeded discoveries; and there would seem to be hardly any limits to the beneficent constituents of coal gas and its bye-products. A scientist had quite recently found that sulphur dioxide was a valuable prophylactic, whereby humanity might be rendered immune from the ravages of influenza; and the Medical Research Committee had taken the matter up warmly, and was aiding the happy discoverer. This gave them something more to which to look forward.

OTHER ACCOUNT FEATURES.

With regard to residuals, they showed a slight falling-off compared with the figures for last year. This was mostly owing to the coke market. They made less out of coke last year than in the preceding one. The previous year was altogether a phenomenal one. It might be remembered that the Government had placed severe restrictions upon the supply of coal generally, and, consequently, there being a shortage of coal, there was an increased demand for coke. So the Company made extraordinary profits. They were good in the year under review, though not commensurate with those of the preceding one. But they were quite up to their expectations. Tar showed an actual increase of £787 upon the preceding year. So he thought they might take it that residuals were satisfactory. Then, as to exchange, the leaps and bounds in the value of silver were matters of notoriety. It was about 2s. 2d. an ounce not long ago; but yesterday the market price was 5s. 10d. per ounce. The rise had had the effect of increasing the price of the rupee very materially, and so had favourably affected the remittances that had been sent to England. They had made £5500 by exchange. Altogether the revenue was £5108 more than it was a year ago. On the other side of the account, they had been able to buy their coals, pay their wages, and effect purification for £1946 less than the previous year. This was a saving which, he was sure, the proprietors would receive with satisfaction. Salaries in India necessarily showed a little increase. The items of Directors and Auditors and Indian income-tax remained the same. The next two items—mains, meters, and services, and wear and tear of works—could be taken together. By doing so, it would be seen that they generally came to about the same amount. In the one case, the charge was about £2000 more; and in the other some £2000 less. To renewals suspense account, £10,000 was carried. They had not been able to execute the works they wished. They had made a start, and were making-up as fast as they could for lost time. He wished they could have done this years ago; but it was quite impossible, owing to the restrictions imposed by the war. Bad debts and allowances were more normal. They wrote-off accounts which had been standing some time on the books, and were beginning to look very doubtful. But although they wrote them off, this did not mean that they were all regarded as hopeless. It strengthened the financial condition of the Company not to have doubtful debts standing too long on the books. General expenses were practically the same. The net result was that the balance forward to profit and loss account was £26,192. Adding this to the balance brought forward and to the dividends and interest upon money they had not expended, and which showed an increase of £250, they had an available balance with which to meet dividends higher by £1578 than the amount brought forward. In the balance-sheet, there was little to which to refer. The amount due by the Company was more. The Board had been buying as much plant and material as was obtainable; and therefore there was an increase of about £3600. He wished it was more—he wished that they could have bought more of their necessaries. On the other side, the amount due to the Company was less by £780. Coals, products, and sundry stores were more by £4483. He ought to tell the proprietors that the Directors wrote-down the stores judiciously. They had no inflation of the stores account. They wrote them down to a very reasonable figure indeed—as much against the Company as possible. Cash in Calcutta and London, and remittances in transit, amounted together to about £22,000. He might add that the records showed very good working. The make of gas per ton of coal was higher by 560 c ft. than in the previous year, the quality was excellent, and the illuminating power was never deficient. The Company's works had been maintained in the best possible condition, having regard to the difficulties and hindrances opposed by conditions proceeding out of the war.

A TWO-YEARS' COAL CONTRACT.

With regard to coal, he was happy to report that they had renewed the contract with their coal contractors for a two years' supply. The same contractors had supplied the Company for many years with good coal; and, as the proprietors would readily realize, the effective discharge of the Company's duties to the citizens of Calcutta depended mainly upon the quality of the coal that was obtained.

THE DIRECTORATE AND THE AUDITORS.

Mr. Robert Miller, who was with them for many years, had sought retirement and rest from some of his labours. The Directors, in conformity with the provisions of the Company's Articles of Association, had appointed Mr. Hugh Henderson Macleod to fill the vacancy. He was a gentleman who had had a long experience of Calcutta. By residence and business there, he knew the commercial life of Calcutta well; and he had a higher qualification for the Board, in that he had a thorough knowledge of the Indian coalfields. This was knowledge that would be of the greatest advantage to the Directors; and they had welcomed the joining of the Board by Mr. Macleod. The next matter was that the Directors had, with regret, to announce the death of Mr. Frederick Seel, who had been one of the Auditors for eighteen years. He was a most accomplished accountant; and the Board always felt safe in having such a man behind them to examine their accounts in conjunction with his colleague. They regretted extremely the loss of Mr. Seel. The Board recommended to the notice of the proprietors, as a candidate to fill the vacancy, Mr. Basil Murton Gill, a Chartered Accountant. Mr. Gill bore a name which was honoured and respected in that room; for his father, Mr. John Blacket Gill was for many years a Director of the Company, and during the latter portion of the time was the Chairman. Mr. Basil Gill had, therefore, so to speak, a relationship with the Company from boyhood; and he would enter upon his duties with a pre-acquired interest in the Company and its fortunes.

INDIA'S PROSPERITY, BUT MANUFACTURING BACKWARDNESS.

In concluding his remarks, he (the Chairman) would observe that, during the twelve months covered by the accounts, India had had a period of great prosperity; and her wealth had been largely increased. The value of her exports, and their ratio to her imports, were very great; but by far the larger part of this superiority was in respect of produce, and not of industrial manufactures. He had at previous meetings spoken on this subject, and expressed his pleasurable contemplation of a future when India should be able to supply all the plant and material required by a gas-works. But with all her great prosperity, India was still mainly an agricultural country; and her manufacturers still awaited development. How backward she was in this respect might be realized from the following passage that he extracted from the evidence given before the Select Committee on the India Bill by Sir Thomas Holland, President of the Industrial Commission and of the Indian Munitions Board, and now of the Board of Industries. Speaking of the little appreciable progress made towards the development of modern technical industries, and the inability to produce more than a small fraction of the articles essential for the maintenance of ordinary civilized activities, Sir Thomas said:

> India makes one form of ordinary structural, but none of the special, steels, or of the essential varieties of ferro-alloys. We have recently produced copper on a small scale; but we smelt no zinc, tin, aluminium or tungsten. We manufacture a small number of heavy chemicals. But, on economic lines, very few of the numerous varieties of medicines, drugs, and dyes that are imported. We export raw rubber to the value of £1,500,000 annually, and import rubber goods worth more than a million. We export raw hides and skins worth £10,000,000, and import leather goods worth a million. Any technologist will realize the state of a country that makes no nails, screws, steel springs, iron chains, wire ropes, steel plates or sheets, machine tools, and internal combustion engines.

This was the evidence of perhaps the highest authority in India; and

he (the Chairman) feared they must wait some time yet before they could draw their supplies of plant and material on the spot.

Mr. A. T. EASTMAN seconded the motion.

Mr. F. W. CRUTTENDEN congratulated the Directors on the satisfactory state of the Company. He noticed in the balance-sheet an item exchange equalization account. He presumed this was profit upon exchange. He suggested that this should be written-off the cost of investments, which he saw showed a depreciation.

Mr. J. H. MACKAY said the Chairman's speech had been so interesting that it left very little for the proprietors to say. But he would like to ask whether the Indian coal measures had been so developed that in course of time the Company would be able to get locally all the coal they required.

The CHAIRMAN replied that the Company carbonized nothing but Indian coal.

Mr. MACKAY said it was satisfactory to know they were not dependent upon coal from this country. As to exchange, when unfavourable, the accounts were debited with the loss. Now that the tables had turned, and they had the satisfaction of seeing to their credit in the accounts the sum of £5579, and in addition a reserve exchange equalization account of £5009, he thought that, as the shareholders had had to put up with a loss on exchange in the past, next year, if this continued, the Directors might consider the paying of an additional dividend to the amount of the profit on exchange. He asked the price charged for gas in Calcutta. The Chairman had spoken of the backwardness of manufacturing development in India. He was associated with a copper company that had recently been developing copper ground in India; and there was every probability that a very large industry in copper would be developed in that particular district.

The CHAIRMAN said with regard to the writing-down of investments, this was a matter that had been raised from time to time. The Board had fully considered the matter, and were opposed to the writing-down. They stated on the face of the accounts what the values of the investments were, and what they were on June 30. The shareholders therefore knew exactly the position. The Board were opposed to increasing or decreasing the value of the investments unnecessarily. They did not think that there was any measurable prospect of having to resort to these investments; and they did not want to sell them. If they wrote them down, they might have at some future time to put them up again; and he did not see any advantage in such see-sawing. With regard to the profit on exchange and an increased dividend, he was afraid he must disappoint the honourable proprietors He (the Chairman) did not think the Directors could contemplate increasing the dividend. They had got five years' arrears of work to do in connection with the plant and works. They must be prudent. The strength of the Company had been made by paying a moderate dividend. When he first joined the Board, they were paying 10 p.ct. Mr. Gill was then Chairman. They considered the matter; and it was agreed that it was impolitic and imprudent to pay such a dividend. The dividend was reduced to 8 p.ct.; and not a dissentient voice was raised at the general meeting against this being done. Out of the saving, the Company were able to pay off £45,000 of debentures. The 8 p.ct. dividend had continued ever since. The matter should be considered; but he did not think he could hold out any prospect of any early change. The price of gas was 5 rupees, less a discount of 8 annas (½ rupee) for prompt payment. The Board reduced the price as often as they could, because they believed in selling gas as cheaply as possible.

Mr. CRUTTENDEN said his only reason for suggesting the writing-down of the investments was the profit on exchange. The investments cost £19,657; and they would never reach such a figure again. They had to provide against this.

The CHAIRMAN: The investments are all gilt-edged.

The motion was unanimously carried.

THE DIVIDEND.

Proposed by the CHAIRMAN, and seconded by Mr. BERTRAM W. ELLIS, a dividend of 8 p.ct. for the year ending June 30 was declared, less income-tax, and the interim payment of 3½ p.ct.

RE-ELECTIONS OF DIRECTORS AND AUDITORS.

Mr. EASTMAN moved the re-election of the Chairman and Mr. Macleod. Fortunately during the time of great stress and of detailed difficulty, their Chairman had had the leisure to do justice to the affairs that had arisen; and he had not spared himself. This had had an immense influence upon the continued prosperity of the Company; and while they had Mr. Ellis in the chair, he was sure this would continue. As to Mr. Macleod, on the retirement of Mr. Miller, they lost the one Indian member of the Board; and fortunately they found a man who, among his various qualifications, knew India and Calcutta, as well as the coalfields and the natives. So they expected to find, when Mr. Macleod took a seat among them, he would be extremely useful. Although the time so far had been short, they had found this to be so.

Mr. STANLEY JONES seconded the motion.

Mr. J. C. WATSON, in supporting it, said he had known the Chairman for many years; and he could say the same of Mr. Macleod. He was a skilled expert, and knew India well. He (Mr. Watson) looked upon him as a valuable acquisition to the Board.

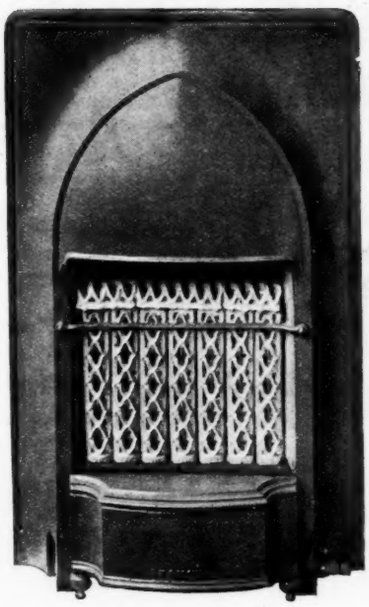
The motion was unanimously carried.

Mr. MACKAY proposed the re-election of Mr. S. W. Savage as an Auditor, and the appointment of Mr. Basil Murton Gill.

Mr. W. C. ELLISSON seconded the proposition, which was unanimously passed.

VOTES OF THANKS.

The CHAIRMAN moved a vote of thanks to the Manager, the Secretary, and the staff generally for their services during the past year. He had already referred in highly praiseworthy terms to the work of their General Manager. He had been with the Company for many years;



NEW "MAIN" FIRES.

THE new "Gothic" Gas Fires are now ready—also many other new designs. Every "Main" Fire will give daily dividends of comfort to your consumers. Don't allow the old type wasteful Gas Fires to continue in use. Replace them with "Mains," so making the most of your output and adding satisfied customers to your list for the good times ahead.

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and he certainly acquitted himself in a remarkably successful manner. He had a thorough knowledge of his business, had tact, the right temper, and discretion in dealing with men; and he knew how to conduct proceedings with public authorities and other dignitaries whom he had to meet. He did it all remarkably well. It was not an easy thing to be gas manager in a distant land like that, where he had no one with whom to consult, and must act on the spur of the moment, with decision and promptitude. With regard to the staff, it was a good one; and Mr. Snelgrove himself said so. They were all gentlemen of very great capability in their various departments; and they were on good terms with the men, including the natives. As to the London staff, Mr. Rainer was an admirable Secretary; and the Board were satisfied with, and grateful to, him for the way he discharged his duties. His assistants also gave the utmost satisfaction.

Mr. MACLEOD seconded the proposition, which was heartily carried.

The SECRETARY said he should have much pleasure in conveying the kind vote of thanks to Mr. Snelgrove and his staff. So far as the London staff was concerned, he asked the Chairman, Board, and proprietors to accept their very best thanks.

Mr. E. COMBER proposed, and Mr. WATSON seconded, a vote of thanks to the Chairman and Directors—the proposer remarking upon the very satisfactory state of the Company's affairs.

The CHAIRMAN having acknowledged the vote on behalf of himself and his colleagues, the proceedings terminated.

DANGER OF FLUELESS GEYSERS.

Woman Poisoned by Fumes.

Some strong comments on the dangers of geysers without flues were made by the Coroner (Mr. Ingleby Oddie) at an inquest held at Battersea on a young woman named Winifred Ethel Dickinson, aged 23 years, who was found dead in a bathroom at a house in Sisters Avenue, Battersea. Her death was stated to be due to carbon monoxide poisoning, caused by fumes from an old-type flueless geyser.

The evidence of deceased's husband showed that deceased went into the room to have a bath. There was a geyser, and it was the custom to open the window when this was lighted, as it had no flue. Half-an-hour later witness called to his wife to hurry-up. Receiving no answer, he went into the bathroom, to find her in a kneeling position, her face nearly touching the water. He laid her back in the bath, and ran off the water, then called assistance. It transpired that death had taken place.

The CORONER: Did you ever think of the danger of these geysers when there is no flue?

Witness: I did not at the time, because the window is usually opened when we put the geyser on. It was not open when my wife was found dead.

What is the name of the geyser?—It is an old type. It was not on when he found his wife.

Was your wife used to opening the window?—Yes.

P.S. *Pike*, who was called to the house, said he examined the bathroom. It was quite a small room, and the geyser was at the end of the bath. It had an open top, allowing the fumes to come into the room. There was no flue. He tested the geyser in the room, and the fumes were very bad.

The CORONER: It is quite an unsuitable geyser?

Witness: Quite.

And a dangerous thing in a small room?—Yes. It is a death trap.

In the medical evidence death was said to be due to carbon monoxide poisoning.

Mr. *Morgan*, an Inspector of the South Metropolitan Gas Company, stated that he went to see the geyser. It was an old type, with a bunsen flame, and a bad flame at that. There was no provision for taking off the products of combustion, and it was totally unsuitable for use. The Company, of course, did not recognize such a geyser; and if they found one they would do everything possible either to get it flued or done away with.

The CORONER: You would not fix a geyser like that?

Witness: Not under any conditions.

Quite right, I thought you would not. The fumes that come off from a geyser after the gas has been burned are poisonous?—Yes.

The fumes are quite invisible, and have no smell?—No.

The CORONER: It is strange at this time of civilization that such a geyser as this is to be found in a house in London—a geyser without a flue, fitted in a bathroom of ordinary size. When it is lighted, all the deadly fumes pour into the room. The gases are poisonous; and it is a marvel in this case that there has not been a fatality before. The practice has been, however, to open the window, and the bathers' lives have been saved. If Medical Officers of Health have no power to inspect bathrooms and condemn such geysers, it is time they had such powers. No one's room should ever have a geyser without a flue to carry off these poisonous fumes. There may be a number of such geysers up and down London, with people not realizing the danger to which they are being subjected. The only way they can be warned is through the Press; and if this poor woman's death does serve to draw attention to the danger of these flueless geysers, she will not have died in vain. There is no blame attaching to the Gas Company. They are not aware of the existence of these things; and if they were, I am sure they would stop them at once. I am certain no gas company would instal such a dangerous device as a flueless geyser.

A verdict of "Accidental death" was recorded.

In a message dated last Wednesday, through Reuter's Agency, it was stated that, as a result of the lack of coal, Versailles had been without gas since Monday, and Evreux was in the same condition. There was no public or private lighting.

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NOTTINGHAM GAS SUPPLY.

At the meeting of the Nottingham Corporation, on Monday of last week, Alderman A. Ball, the Chairman of the Gas Committee, replied to recent criticisms regarding the indifferent quality of gas supplied to city and district consumers, pointing out the abnormal difficulties with which, in common with others, those responsible for the management of the undertaking had had to contend during the war period and since the cessation of hostilities. Want of adequate transport facilities for coal continued to be one of the main troubles. About a month previously, arrangements were made to improve the quality of the gas supplied in Nottingham from 425 B.Th.U. to 500 B.Th.U.; but the Committee received a distinct warning that it might not be possible to allocate to the city the amount of coal necessary to maintain the gas supply, and he was afraid that it might possibly be found requisite to again reduce the quality of the gas in the near future. It was doubtful whether there would ever be a return to the old standard of illuminating power. He paid a high tribute to the excellent work of the Gas Engineer and Mnnager (Mr. John Wilkinson), and, upon the question of the price charged to consumers, emphasized the consideration that though there had been an increase from 2s. 4d. to 4s. 6d. per 1000 c.ft. on the pre-war rate, the advance was nothing in comparison with the corresponding increase in the cost of manufacture. Given free and unrestricted markets in which to buy coal and other necessary materials, with the co-operation of the workers, Nottingham could, he claimed, produce gas as good and cheap as any city in England.

Mr. H. BOWLES, the leader of the Labour Party in the Council, said that Alderman Ball might have convinced some, but he had not convinced him that the gas undertaking was in a very good state. Neither had the Chairman convinced the poor suffering gas consumers outside the Council. The matter should be discussed specially at the next meeting of the Council.

Alderman BALL asked if there was any reason why it should not be discussed now. He was satisfied—and he believed every member of the Gas Committe was satisfied—that the undertaking was not in a satisfactory condition; but what he wanted to make clear to the public was that neither Mr. Bowles nor any other man could do more than Mr. Wilkinson had done. It was unfair to infer that he had not done his duty.

The Council then passed to the next business.

Sir Arthur Duckham's name has been introduced into the subject of the Nottingham gas supply (which continues to be freely discussed in the columns of local newspapers and at municipal meetings), prominence having been given by the Chairman of the Committee to the purport of an interview with Sir Arthur, who declared that if the Corporation authorities were making gas of a calorific value of from 425 to 500 B.Th.U., they were doing more than they ought. The effect, he added, of a rich gas on incandescent light was bad, because a good mixture of gas and air could not be obtained. Admitting that the present standard for flat-flame burners was unsatisfactory, Sir Arthur Duckham took it for granted that the Nottingham Corporation, when putting in a slot meter, also provided the incandescent fittings; but Alderman Ball confessed that this was not done. "Are we forced to make gas of a tenuous quality?" was the subject of interrogation, to which Sir Arthur replied: "The Government have laid down a certain standard of quality, because you want to get all the good out of the coal for the benefit of the country in the most economical way." Coming to the present position of the gas undertaking, Alderman Ball added that there were not more than four days' coal stock at Basford; and if they had six days' more experience such as that of the previous Sunday, they would have neither coal nor gas. He had seen the Coal Controller, and begged hard for further supplies, which elicited from Sir Arthur Duckham the observation: "I too have made pleas on Alderman Ball's behalf." Sir Arthur paid a warm tribute to Mr. John Wilkinson's efficient management of the undertaking in the observation: "Mr. Wilkinson is about the keenest and most capable engineer I have ever met."

COOKER AND METER RENTS AT HULL.

The question of increased rentals for meters and gas-cookers, imposed by the British Gas Light Company at Hull, was further considered at a meeting of the Corporation Water and Gas Committee on Monday of last week, when a letter was received from the Company intimating that, though the increase of 50 p.ct. in the rentals of cookers was fully justified, they had decided to waive it. They maintained that the 50 p.ct. increase in meter-rentals was legitimate and reasonable.

The Corporation Engineer (Mr. C. B. Newton) stated that he was of opinion that 100 p.ct. increase in cooker-rentals would not have been excessive, having regard to the greatly increased cost of repairs and maintenance. It was considered, however, that an all-round increase of 50 p.ct. for stoves and meters would be the fairest and most acceptable method of dealing with the matter—especially as the hirers of cookers were offered the alternative of purchasing, on favourable terms, the appliances on hire. The Company, in their letter, now intimated that the Directors had decided that, for the present, they would not increase the rentals of gas-cookers or appliances already fixed; but it was intended that the rentals of new stoves and apparatus should be advanced proportionately to the increased cost of same and the labour and materials required in fixing.

In the discussion which ensued relative to the increased meter-rents, it was contended that the advance of 50 p.ct. was not justified. In their letter, the Company pointed out that the meter-rents were voluntarily reduced by them when the earnings of the undertaking enabled them to do so. When this position no longer existed, it had become necessary to increase the rents; but with the added 50 p.ct. they were well

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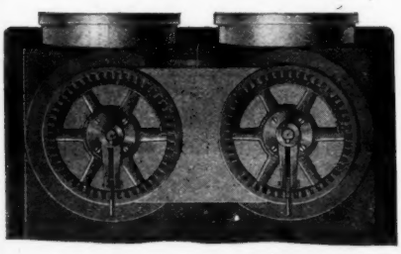

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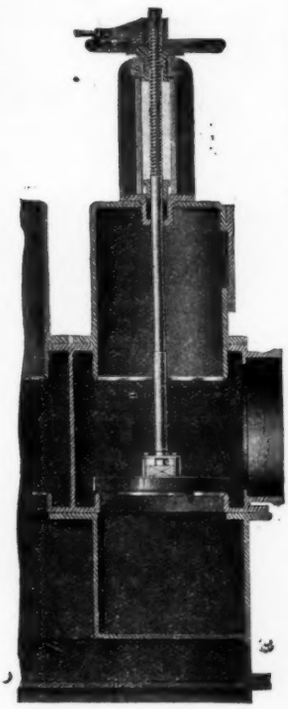

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within the maximum limit prescribed by Parliament. In reply to criticism as to the cost of repairs and maintenance of the meters, the Company stated they had to consider the revenue derived from the meters as a whole. Mr. J. W. Locking alluded to the proceedings at the annual meeting of the Company recently, and claimed that their increased profits did not justify the increases the Company had made in the price of gas and in the meter and stove rentals. In spite of the higher cost of labour and materials, the Company had increased their profits by over £8000. He suggested that the Committee should have a conference with the Corporation Electricity Committee, "to see if it was not possible to bring some competition against the Company, to counteract them to some extent."

The Committee accepted this suggestion, and appointed a Special Sub-Committee to confer with the Electricity Committee.

The Corporation purchase gas in bulk from the Company, and distribute it in the area of the Old Town. The Company applied for a revision of the price, and suggested that it should be raised from 1s. 10d. to 3s. per 1000 c.ft.; but the Committee would only agree to the price being 2s. 6d. The Engineer stated that he had gone carefully into the matter on the figures submitted; and the Company were entitled to a price of 2s. 6d. To meet this enhanced cost, the Committee decided to raise the price to the consumers from 3s. 6d. to 4s. 6d. per 1000 c.ft.; the Deputy Lord Mayor remarking that they had made a loss on the undertaking during the last few years. A proposal by the Engineer to increase meter-rents was deferred till the end of the municipal year.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 24.

Pitch continues in a very healthy position, and considerable business is reported at well over 80s. net per ton f.o.b. makers' works. There is large inquiry in the market for benzol and tar oils for export. It is clear that the practice of burning creosote, or a mixture of pitch and creosote, as a fuel is extending from this country to the Continent. Creosote is on strong demand, and the price is 6½d. to 7d. net per gallon in bulk *ex* makers' works. The demand for tar materials for roads still continues. Other tar products are unchanged. There is no alteration to report as to sulphate of ammonia for home agriculture.

Tar Products in the Provinces.

Nov. 24.

The average values for gas-works products during the week were: Gas-works coal tar, 39s. 6d. to 44s. 6d. Pitch, East Coast, 70s. to 72s. 6d. per ton f.a.s.; West Coast—Manchester, 62s. 6d. to 65s.; Liverpool, 62s. 6d. to 65s.; Clyde, 72s. 6d. to 75s. nominal. Benzol 90 p.ct., North, 1s. 8d. to 1s. 10d.; crude 65 p.ct. at 120° C., 1s. 0½d. to 1s. 1½d. naked at makers' works; 50-90 p.ct. naked, North, 1s. 8d. to 1s 10d. Toluol, naked, North, 2s. to 2s. 1d. nominal. Coal tar crude naphtha in bulk, North, 8d. to 8½d. Solvent naphtha, naked, North, 2s. 3d. to 2s. 4d. Heavy naphtha, North, 2s. 2d. to 2s. 3d. Creosote, in bulk, North, liquid, 5⅛d. to 5⅜d.; salty, 4⅜d. to 5d. Heavy oils, in bulk, North, 6d. to 6½d. Carbolic acid, 60 p.ct., 1s. 6d. to 1s. 6½d. Naphthalene, £15 to £17 10s.; salts, £4 10s. to £6, bags included. Anthracene, "A" quality, 7½d. to 8d. per minimum 40 p.ct.; "B" quality, nominal.

Manchester District Tar Prices.

The average price realized for tar in the Manchester district, based on the value of the products, for the month of October was £2 15s. 4·6d.

FROM A MARKET CORRESPONDENT.

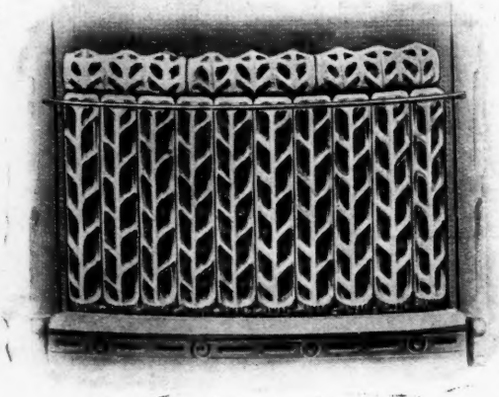
Tar Products.

Conditions are much stronger, for which the reason suggested is that in many cases producers are unable to work at full pressure, owing to shortage of raw material. Buyers evidently anticipate a continuance of high prices, as they are endeavouring to effect purchases for all periods of next year. This is especially the case with pitch, in which there is continued good inquiry. South Wales buyers have offered to make contracts for purchase for 1920 delivery at a minimum of £4 per ton. This, of course, suggests considerable confidence in the position. Much, however, will depend upon whether outputs of coal are increased shortly. Crude tar is very firm, and contracts for delivery next year are likely to produce very satisfactory prices. There is a good demand for commercial qualities of anthracene at an advanced quotation. Creosote also is slightly dearer on a sustained inquiry for fuel purposes. At current rates, however, it must be rather extravagant. There is not much change in naphthalenes; there being a good demand for crude and an improvement in the price of refined. Solvent naphtha is higher on the week. Carbolic acid remains without any change, and the price of crude too low to bring about any increase in supply. There is a very fair demand for benzol, without any change in price, although supplies are rather short. Toluol is not plentiful, and will be wanted in larger quantities in all probability for mixing with benzol for motoring purposes in the winter. Other products are unchanged.

The range of quotations is as follows:

Benzol: 90% London 2s. to 2s. 2d., North 1s. 11d. to 2s.; 50-90% 1s. 9d. to 2s. London, 1s. 10½d. North; crude, 60-65% 1s. 5d. to 1s. 7d.; pure, 3s. per gallon naked.

Carbolic Acid: Crude 60's 1s. 6d. per gallon nominal; crystals, 40%, 7½d. per lb.



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Crude Tar: London, 50s. to 55s.; Midlands, 50s.; North, 50s. per ton *ex* works. Refined tar, 32s. 6d. per barrel (free) on rail.

Pitch: London, 80s. to 85s. per ton; East Coast, 72s. 6d. to 77s. 6d. per ton; West Coast, 72s. 6d. to 75s., with Manchester 72s. per ton and Glasgow 72s. per ton; South Wales, 75s. to 80s. per ton.

Solvent Naphtha: London, 2s. 11d. Provinces average 3s. per gallon.

Crude Naphtha: Naked, 9d. per gallon.

Heavy Naphtha: 2s. 6d. per gallon.

Naphthalene: Refined, £18 to £20 per ton nominal; crude, £6 10s. to £11, according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 3s.

Creosote: London, 7¼d.; North, 6d. to 6½d.; heavy oil, 6d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Aniline Oil: 1s. 3d. per lb.

Cresylic Acid: 95%, 2s. 5d. to 2s. 6d.; 97-99%, 2s. 7d. to 2s. 8d. *ex* works London, f.o.b. other ports.

Sulphate of Ammonia.

A steady demand is maintained in the home trade; the movement probably being accelerated by the knowledge that prices become dearer month by month until March. Foreign inquiries are increasing; and with a continuation of the coal trouble in the States, it is not unlikely that some Japanese business may once again come to our manufacturers. Export quotations are quite nominal round about £26 per ton, and very little material is available for this trade. The British farmer has done some grumbling about the price he has to pay; but he would have a good deal more to say if makers deprived him of his sulphate of ammonia in order to cater for the far more remunerative business which could be secured from the foreign farmer, who does not raise a protest about price so long as he can get the material.

Irish Gas Shortage.—The Gorey (co. Wexford) gas supply had to be suspended, owing to the difficulty of procuring coal. A crisis also arose at Letterkenny (co. Donegal) Gas-Works, because of the impossibility of securing railway wagons to convey coal from Londonderry. The works were only kept going by a supply given by a local miller.

Gas Pressure at Padiham.—At the last meeting of the Padiham Urban District Council, Mr. Russell said there were many complaints about the gas supply. The Engineer was of opinion that some of the pipes were corroded, and there was unequal pressure. It was not the quality of the gas that was wrong. In some cases it was the unsuitable state of the burners, and in others pipes were not equal to supplying gas for cooking and lighting. The Gas Committee would have to consider the question of renewing a lot of the service-pipes.

A Gas-Stove Profiteering Prosecution Ordered.—There having been three cases of profiteering alleged against the Gas Light and Coke Company in respect of the sale of stoves, the Willesden Tribunal have ordered proceedings to be taken in the Police Court.

Electricity and the Rates at Hastings.—In the course of a Ministry of Health inquiry regarding an unopposed application by the Hastings Town Council for sanction to borrow £14,219 for the purposes of the electricity undertaking, the Town Clerk mentioned that the total charge to the rates of the undertaking from the time of purchase had been £35,000. They, however, possessed a property which must be of a value of nearly £150,000. The rates in the town are now 10s. 6d. in the pound. Mr. R. Ferguson (the Electrical Engineer) said that in seven years the number of consumers had been doubled; and he told the Inspector that he wanted to develop the heating and cooking side, so as to improve the day load.

Colonial Gas Association, Ltd.—The Directors will report at the annual meeting of the Association next Tuesday that, as compared with the previous year, the total gas sales for the twelve months ended June 30 show an increase of 10·19 p.ct. The profit for the year amounts to £18,569, to which has to be added the balance of £3363 brought forward from the previous year, making a total of £21,932, from which, after providing for debenture and other interest, also for renewals and depreciation, and deducting the dividend paid on the preference shares for the half year ended Dec. 31, there remains an amount available for distribution of £14,163. The Directors recommend payment of a dividend on the ordinary shares of 7 p.ct. (less tax) for the year, carrying forward £5606. An extraordinary general meeting will follow, to authorize the issue of more preference shares.

Gas Discussed at Swadlincote.—At a meeting of the Swadlincote Urban District Council, Mr. Goodhead (the Chairman of the Lighting Committee) said during the last few weeks there had been many complaints as to the gas. He explained that, owing to inferior coal and the shortage of labour due to illness, they had found it very difficult to keep things going at the gas-works; and the pressure had as a result been very low. In fact, never in the history of the concern had the gas been so low in the holders as it was at this time. Mr. Soar expressed the hope that when the new plant was installed there would be an improvement; and Mr. Earp retorted that it was time something was done, as people were getting sick and tired of the present state of things. Mr. Goodhead said the Manager (Mr. F. Robinson) had been doing his best to give them a good pressure, and they were working with only one week's reserve of coal.

The Directors of the Churnet Valley Gas Company, Ltd., have issued their annual report, showing a profit for the year ended Sept. 30 of £1410. They recommend a dividend of 5 p.ct., less tax.

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RELIABLE. There are no delicate or complicated parts to get out of order; it never fails or gives trouble.

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Coke Charge Complaint Dismissed.—The Malton Profiteering Committee have dismissed a complaint from Col. Sir J. D. Legard with respect to the price charged by the local Gas Company for coke. The grounds for dismissal was that coke was outside the jurisdiction of the Committee, and that the complaint had not been lodged within four days.

Proposed Extensions at Troon.—The proposed extension of the gas-works at Troon has been under consideration. Mr. George Keillor, the Manager of the Greenock Corporation Gas-Works, has made a careful survey; and his report recommends the installation of vertical retorts, and enumerates other additions necessary to bring the works up to date. The approximate expenditure will be £37,100. When completed and in full working order, the saving over present outlays is estimated at more than £3000 a year.

Ewart and Collis, Ltd.—A Company bearing this title has been registered, with a capital of £425,000 in 200,000 8 p.ct. cumulative preference shares and 225,000 ordinary shares, both of £1 each, to acquire all or part of the business, assets, and liabilities of Messrs. Ewart & Son, Ltd., and Messrs. J. Collis & Sons, Ltd., or either of them, and to carry on the business of geyser manufacturers, ventilating and hot water engineers, electrical and general engineers, bath manufacturers, &c. The registered office is at 350, Euston Road.

Economy of Gas in Housing Schemes.—As the result of his attendance at the conference of the British Commercial Gas Association, Mr. A. E. Evans (the Chairman of the Gas and Water Committee) has been enabled to draw up a report showing the Wallasey Housing Committee how, by the use of gas, a saving of £20,000 to £30,000 could be effected in connection with a local scheme for the building of 700 houses. In his report, he asks why public authorities engaged in building houses should go to the expense of providing coal-grates which will be seldom used, and in front of which gas-fires will ultimately be fixed by the tenants.

Effect of Bad Coal in Glasgow.—The Glasgow Gas Department have explained to an inquirer that the chief cause of such defects as may be noticed in the gas supply is the inferior quality of coal supplied to them. In normal times the department were able to a large extent to select the coal used in the manufacture of gas; but at present they must accept the supplies sent by the Controller. These supplies are mostly mixed with stones and other foreign materials. The handling of the coal is performed by machinery; and when stones and other foreign bodies get into the plant the process of gas making is retarded, and much trouble and considerable delays arise. There is little prospect of improvement until a better quality of coal is obtained and the officials are in a position to exercise supervision over supplies.

Extinguishing a Flame with Dynamite.—Drastic means had to be adopted for extinguishing a huge flame of gas issuing from an oil-well in the midway field of California. The flow of gas from the well was estimated at about 100 million cubic feet a day; and the usual methods of steam, mud, and water only succeeded in extinguishing the fire for 50 ft. from the ground. Above this, the gas continued to burn. The use of dynamite was suggested upon the theory that after the steam, mud, and water had subdued the lower flames, the concussion of the dynamite would break the stream of gas long enough to allow the flames at the top to burn out before the intercepted stream of gas from the well could again reach them. This plan seemed so feasible that it was decided to try it. When the charge of dynamite was exploded, there was a deep red glow, a black puff, and the flame was out. The material used consisted of 100 barrels of carbon tetrachloride and 150 lbs. of dynamite.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Nov. 19.]

Nos. 27,696—28,401.

BALE, G. F.—"Apparatus for retorting, and briquetting fuels with volatile recovery." No. 27,921.
BLAKELEY, W.—"Means for reversing flow of gas in purifiers, condensers, &c." No. 28,353.
BLOOMFIELD, H.—"Suction-gas producer." No. 28,294.
BOHAR, V.—"Means for preventing ignition of combustible atmosphere by escaping products of combustion." No. 27,725.
BRIERLEY, W.—"Gas-radiator." No. 28,103.
BRUNNSCHWEILER, K. A.—"Heat-distributing devices for gas-stoves." No. 28,381.
CANNING, T. F.—"Retorts, ovens, &c." No. 28,047.
CHOLLET, L.—"Means for distribution of fluids." No. 27,717.
FIRTH BLAKELEY, SONS, & Co.—See Blakeley. No. 28,353.
GRICE, T.—"Attachment for gas-fire." No. 27,915.
HAWKINS, H. W.—"Gas-burners." No. 27,854.
INGRAM, E.—"Economizer for gas cooking-stoves." No. 27,847.
KIRBY, W.—"Purification of carbazole." No. 28,279.
LIDBERG, T.—"Method of controlling temperatures." No. 27,768.
MARSH, R. G.—"Devices for carburetting air and gases." No. 27,840.
MORGAN, F. J.—See Bloomfield. No. 28,294.
PERRY, W. P.—"Apparatus for distilling carbonaceous material." No. 27,770.
SARGEANT, E. F.—"Means for discharging coal-trucks." No. 28,201.
SERRET, A. B.—"Recovery of ammonia as bye-product." No. 28,093.
SOC. FRANCO-BELGE DE FOURS À COKE.—"Recovery of ammonia contained in gases from coke-ovens, &c." No. 28,326.
SOUTH METROPOLITAN GAS COMPANY.—"Drying salts." No. 28,278.
SOUTH METROPOLITAN GAS COMPANY.—See Kirby. No. 28,279.
TOWNSEND, W. W.—"Water-gas plant." No. 28,208.
WASHBURN, G. H. & G. P.—"Acetylene burner." No. 28,242.
WHITE, A. E.—See Soc. Franco-Belge. No. 28,326.
WHITE, T. H.—"Generators for water and producer-gas plants." No. 28,253.

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¶ *Carron Company's Gas Fire Pamphlet 6m—free on request—gives full particulars of Patent Silent "Stella" Gas Fire and other popular Carron Gas Fires.*

CARRON COMPANY
WORKS—CARRON, STIRLINGSHIRE.

The harbour at Buckie is to be lit on the high-pressure system; the offer of the Buckie Gas Light Company having been accepted. The plant installed by the Company is by the Keith-Blackman Company.

The Midland Section of the Coke-Oven Managers' Association will hold the first meeting of the session at the Grand Hotel, Sheffield, on the 29th inst., when the Chairman (Mr. J. A. Davy, of Crigglestone) will deliver his Inaugural Address.

The Chesterfield Gas Engineer (Mr. H. Davies) has introduced to the Gas Board a comprehensive scheme for a re-organization of the gas-works, with a view to improving the manufacture and distribution. The scheme has been adopted by the Board, and the details have been left to a Sub-Committee.

The new Gas Convener at Perth (Mr. Thomas Hunter) has called for a comprehensive report on the city gas supply; and the Gas Committee have signified approval of the step. The report will deal generally with the means that might be employed to improve both the heating and lighting power of the gas.

It is stated that one wagon invoiced to the Glasgow Gas-Works as containing 7 tons 14 cwt. of coal, upon examination was found to contain 1 ton 11 cwt. of dross and 1 ton of stones. The remainder was coal of very inferior quality.

We are informed that the new works in Victoria Road, Willesden, of the Torbay and Dart Paint Company, Ltd., have now been completed; and anyone interested in the water-proofing of concrete can there see specimens of the Company's specialities. Just what these specialities are was, it will be remembered, fully explained in an article which appeared on p. 432 of the "JOURNAL" for May 20 last.

Messrs. Bolckow, Vaughan, and Co., Ltd., propose to erect at Middlestone Moor, midway between Bishop Auckland and Spennymoor (Durham), a large factory to develop the materials that now form the bye-products from their many collieries in the county. These intermediates include nitric acid, sulphuric acid, and benzol. A new company will be formed. The scheme is part of a much bigger project which is in contemplation.

STOCK MARKET REPORT.

QUITE a change has come over the aspect of things on the Stock Exchange. The opening was rather doubtful; but even before the close of Monday an improvement began to show itself. This materialized and strengthened from day to day, as confidence in the money outlook begat quite a cheerful tone, and many markets showed a nice array of firm prices.

In the gilt-edged market, Home Government issues, after a poor start, had a successful progress; the closing quotations being: Consols 51-51⅛, War Loan 91¼-91⅝, Funding 76-77, and Victory 80¼-81. Bonds also kept in step with them. Home Rails at last had a welcome change, and met with support from buyers. Argentines were in good demand.

The Foreign Market was better owing to a cessation of pressed selling. French Loans made a very fair recovery, and Chinese and Japanese advanced. Russians were much left alone, and South Americans were easier.

In the Miscellaneous group there was great interest. Extraordinary activity in Oils was the chief feature, and large advances in price were made. Rubbers were in good demand. Textiles did well, and Iron and Steel were steady.

Business in the Gas Market was brisker and fairly well distributed throughout the list, and the general tendency was quite favourable. The London companies showed further improvement; the quotation of the Gas Light ordinary being 1 higher, and that of South Metropolitan 3 higher. Among the Provincials, Alliance and Dublin, both ordinary and debenture, rose 2. Imperial Continental was very active and strong. From an opening price of 134, it rose to 143. The debenture also advanced 3. Continental Union preference was quoted 40-60.

Bargains done for cash during the week were as follows: On Monday, Alliance and Dublin 48⅝, European 12½, Gas Light ordinary 63, 63½, Imperial Continental 134, 134½, 135, 135½, 136, Monte Video 80, Primitiva 36s. 3d., ditto debenture (1911) 50¾, South Metropolitan 61, 64, ditto debenture 53, Croydon 5 p.ct. "D" 72. On Tuesday, Bournemouth debenture 66½, 67, Brentford "B" 56, Gas Light ordinary 63½, 64, 64¼, 64½, 64⅝, ditto preference 67, Imperial Continental 134½, 135, 135⅝, 136, 136½, 137, Primitiva 36s., 38s. 9d., South Metropolitan 61½, 62½, 63, Tottenham 53½. On Wednesday, Alliance and Dublin 47, European 12, 12½, Gas Light ordinary 63¼, 64, ditto maximum 45, ditto debenture 52½, Imperial Continental 137, 138, ditto debenture 84½, Oriental 106, Primitiva 36s. 3d., South Metropolitan 62½. On Thursday, Alliance and Dublin 48½, Bournemouth 10 p.ct. 18⅝, 19, ditto "B" 10½, 10⅜, ditto debenture 66⅛, 67, Continental Union 35, Gas Light ordinary 63, 63¼, 64, 64½, 65, ditto maximum 45, ditto preference 66, 66¼, 66⅝, ditto debenture 52½, 53, Hong Kong 9⅛, 9 5/16, Imperial Continental 136¼, 136½, 137, 137½, 137½, 138, 138½, Maidstone 60, 60½, Malta and Mediterranean 45s., Oriental 105½ 106, South Metropolitan 64, 64½, 65, ditto debenture 52½, 53, Southampton 61⅜, ditto debenture 64⅝. On Friday, British 26½, Croydon "B" 99½, Gas Light ordinary 64½, 65, 65½, ditto maximum 45¾, Ilford debenture 62, Imperial Continental 139, 139½, 140, 140⅜, 141, 141⅜, 142, 142½, 143, Monte Video 77½, Newcastle 64⅜, Primitiva 36s. 9d., 39s. 6d., ditto preference 65s., 67s. 6d., 70s., South Metropolitan 65.

In the Money Market there was a good steady demand, but no apprehension of a rise in rates. The price of silver reached a new record, 74d.

The Bank rate is 6 p.ct., as fixed on the 6th inst.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Share	When last Dividend.	Ante-War Dividend & Bonus p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices	Lowest and Highest Prices of Bargains.
189,049	Stk.	July 31	4	4%	Aldershot 4 p.c. Pref.	..	60—65	..
1,551,868	"	Sept. 26	9½	2[illegible]%	Alliance & Dublin Ord.	59—64	45—53	47—48½
574,000	"	July 11	4	4%	Do. 4 p.c. Deb.	76—79	62—64	..
280,000	5	Oct. 30	7½	3%	Bombay, Ltd.	5½—6	5½—5⅝	..
50,000	10	Aug. 28	16	12½	Bournemouth Gas and Water { 10 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	20—30	19—20	18½—19
888,110	10	"	7	7%		15—16½	10—11	10½—10⅝
116,000	10	"	6	6%		13½—14	9½—9⅝	..
159,740	—	June 27	—	4%		..	65—67	66½—67
992,045	Stk.	July 11	14	37/-	Brentford A Consolid.	261—266	56—61	..
784,920	"	"	11	31/8	Do. B New	204—209	52—57	56
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	76—78	..
221,490	"	June 11	4	4%	Do. 4 p.c. Deb.	91—98	64—68	..
314,775	"	Sept. 11	11	7½%	Brighton & Hove Orig.	208—218	123—128	..
344,300	"	"	8	5½%	Do. A Ord. Stk.	154—159	84—89	..
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
680,000	20	Sept. 26	13½	10%	British	44—45	25—27	26½
120,000	Stk.	June 27	4	4%	Do. 4 p.c. Deb. Stk.	88—90	63—65	..
345,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	60—63	..
100,000	10	—	—	—	CapeTown & Dis. Ltd.	1½—2½	6½—7½	..
100,000	10	Oct. 30	—	4½%	Do. 4½ p.c. Pref.	4—6	6½—7	..
100,000	Stk.	June 27	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	61—66	..
157,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,518,280	"	Aug. 14	5/9/4	33/4	Commercial 4 p.c. Stk.	106—108	56—61	..
560,000	"	"	5½	26/8	Do. 5½ p.c. do.	103—105	52—57	..
476,000	"	June 11	8	8%	Do. 8 p.c. Deb. Stk.	69½—71½	50—52	..
800,000	"	"	4	—	Continental Union Ltd.	76—79	35—40	35
800,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	40—60	..
51,600	Stk.	Aug. 28	14½	12%	Croydon A 10 p.c.	..	135—145	..
278,400	—	"	11½	9%	Croydon B and C 7 p.c.	..	95—105	99½
492,270	Stk.	—	6	5½%	Derby Con. Stk.	128—136	..	
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	..	
1,009,180	10	July 30	10	5/0	European, Ltd.	17½—18	12—13	12—12½
16,298,975	Stk.	"	4/17/4	30/-	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds	98—102	63—66	63—65½
2,600,000	"	"	3½	26/8		76—79	45—47	45—46⅝
4,063,235	"	"	4	4%		96—99	65—68	66—67
4,674,850	"	June 11	8	8%		73½—74½	52—55	52½—53
180,000	"	"	10	10%		..	..	..
82,500	"	Sept. 11	5	4½%	Hastings & St. L. 5 p.c.	..	57—62	..
268,740	"	"	3½	2½%	Do. 3½ p.c	37—39	40—45	..
70,000	10	April 29	11	7%	Hongkong & China, Ltd.	16½—16⅝	8½—9½	9½—9 5/16
86,600	Stk.	Aug. 28	9	8½%	Hornsey 7 p.c.	..	90—95	..
181,000	"	Sept. 11	7½	5½%	Ilford A and C.	151—154	88—93	..
65,780	"	"	6½	4½%	Do. B	115—118	67—72	..
65,560	"	June 27	4	4%	Do. 4 p.c. Deb.	92—94	61—64	62
4,940,000	"	May 14	9	4½%	Imperial Continental	138—140	138—143	134—143
1,935,000	"	Aug. 14	8½	3½%	Do. 3½ p.c. Deb. Red.	84—86	84—87	84½
285,943	"	Sept. 11	6½	5½%	Lea Bridge Ord. 5 p.c.	119—121	87—92	..
2,498,966	"	Feb. 26	10	42/6	Liverpool 5 p.c. Ord. { A B	211—218 146—148	..	..
806,068	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
165,736	"	Aug. 14	7/5/6	32%	Maidstone 5 p.c.	..	56—61	60—60½
75,000	5	June 11	6	8%	Malta & Mediterranean	4½—4⅝	1⅝—2⅛	45/-
250,000	100	Oct. 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	90—97	..
541,920	Stk.	May 29	4	—	Monte Video, Ltd.	11½—12	77—82	77½—80
1,876,893	"	July 30	4½	3½%	Newcastle&Gatsh'd Con.	98½—99½	68—65	64⅜
539,705	"	June 27	3½	3½%	Do. 3½ p.c. Deb.	87—88	57—58	..
15,000	10	Sept. 11	—	11%	North Middlesex 10 p.c.	..	18½—18⅝	..
65,940	10	"	7/14/0	7%	" " 7 p.c.	14—15	9—9½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—107	105½—106
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7½—7⅝	4⅜—5½	..
60,000	50	Aug. 28	12	7½%	Portsea, Island B	128—131	74—76	..
100,000	50	"	12	6½%	Do. C	118—121	66—68	..
949,980	5	April 29	8	—	Primitiva Ord.	5½—6	1⅜—2½	36/—39/6
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4½—5	3½—3⅝	65/—70/-
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—98	71—73	..
600,000	Stk.	July 30	4	4%	Do. " " 1911	..	49—52	50⅜
846,198	"	June 27	4	4%	River Plate 4 p.c. Deb.	85—87	49—52	..
150,000	10	Sept. 26	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	7½—8	..
125,000	50	July 2	5	5%		47—49	40—42	..
185,000	Stk.	Aug. 28	10	5%	Sheffield A	228—234	87—92	
209,984	"	"	10	5%	Do. B	222—224	87—92	..
528,500	"	"	10	4½%	Do. C	223—229	80—85	..
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	Oct. 15	9	10%	South African.	10½—11½	12—13	..
6,609,896	Stk.	Aug. 14	5/4/0	30/-	South Met. 4 p.c. Ord.	111—115	68—65	61—65
250,000	"	July 11	—	5%	Do. Pref.	..	94—96	..
1,896,445	"	"	8	8%	Do. 3 p.c. Deb.	72½—74½	51—54	52½—53
224,820	"	Aug. 14	8½	6%	South Shields Con. Stk.	157—159	104—106	..
962,795	"	"	6	3[illegible]%	S'th Suburb'n Ord. 5 p.c.	114—116	68—78	..
167,568	Stk.	June 27	5	5%	Do. 5 p.c. Deb. Stk.	115—118	85—88	..
647,740	"	Nov. 18	7½	3[illegible]%	Southampton Ord.	99—102	61—63*	61⅜
121,275	"	June 27	4	4%	Do. 4 p.c. Deb. Stk.	..	63—65	64⅜
150,000	"	Aug. 14		4½%	Tottenham District { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	135—138	70—75	..
799,275	"	"	6	3%		115—117	50—55	53½
181,255	"	June 26	4	4%		87—89	54—56	..
182,350	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
298,476	Stk.	Sept. 26	5	3[illegible]%	Tynemouth 5 p.c. max.	108½—109	74—76	..
80,000	"	Aug. 28	8⅜	55/-	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	85—90	..
255,688	"	"	6½	40/-	Do. B 3½ p.c.	129—134	63—68	..
108,075	"	"	—	38/6	Do. C	..	63—68	..
140,855	"	"	—	38/6	New Ordinary	..	63—68	..
353,000	"	"	6½	38/9	Wimbledon 5 p.c.	117—122	65—70	..
98,000	"	"	6⅜	40/-	Epsom 5 p.c.	121—126	65—70	..
88,416	"	June 27	3	3%	3 p.c. Deb. Stk.	85—89	49—51	..

* Ex Div.

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(See p. 460.)

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THE Directors beg to Thank the Applicants for the Post of ENGINEER and MANAGER to the Company, and have to state that the POSITION IS NOW FILLED.

GOOLE URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS AND WATER ENGINEER AND MANAGER.

THE Goole Urban District Council invite Applications for the Appointment of ENGINEER and MANAGER of the Council's Gas-Works and Water-Works, at a Salary of £400, rising by four Annual Increments of £25 to £500 per Annum.

Applications, stating Age and Experience of the Applicant, accompanied by *copies* of not more than three recent Testimonials, to be sent addressed to the undersigned, endorsed "Gas and Water Engineer," by 10 a.m. Wednesday, the 3rd of December, 1919.

Canvassing in any form will Disqualify.

J. W. PULLON,
Clerk to the Council.

Council Offices,
Goole,
Nov. 13, 1919.

CORK GAS CONSUMERS' COMPANY.

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